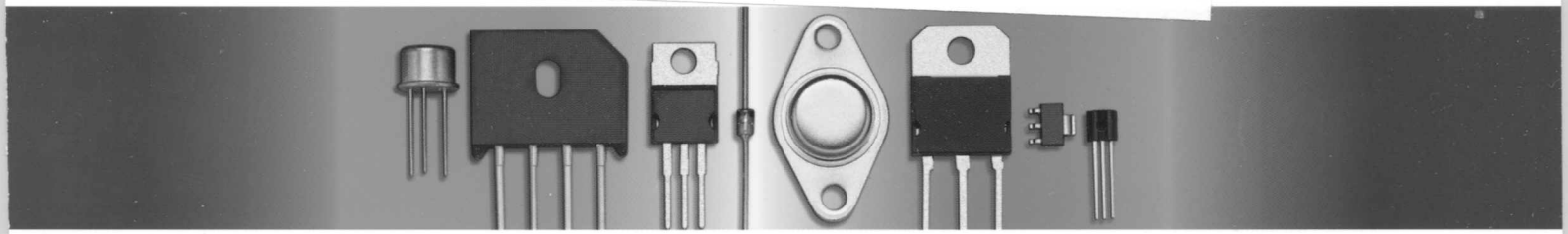
Central™
Semiconductor Corp.



DISCRETE SEMICONDUCTOR SELECTION GUIDE

1999

CERTIFICATE

TUV Rheinland
of North America, Inc.

hereby certifies that

Central Semiconductor Corp.
145 Adams Avenue
Hauppauge, NY 11788, USA

has established and applies
a quality system for

the Design and Manufacture of
Discrete Semiconductors.

An audit was performed, Report No. 7654

Proof has been furnished that the requirements according to

ISO 9001 / ANSI/ASQC Q9001-1994 / EN ISO 9001

are fulfilled.

The certificate is valid until
October 24, 2000

Certificate Registration No.
74 300 7654

Newtown, CT, October 24, 1997

President

ANSI-RAB QMS ACCREDITED

Newtown, CT, October 24, 1997

Manager, Certification Office

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

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* Special Order

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MXT2222A	CXT2222A	EM	53
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MXT2907A	CXT2907A	EM	53
MXT3904	CXT3904	EM	53
MXT3906	CXT3906	EM	53
MXTA14	CXTA14	EM	53
MXTA42	CXTA42	EM	53
MXTA43	CXTA42	EM	53
MXTA92	CXTA92	EM	53
MXTA93	CXTA92	EM	53
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NS012	CS220-16B	SE	191
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NS605	CS220- 8M	SE	190
NS609	CS220-16M	SE	191
NS612	CS220-16M	SE	191
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NT225	CQ220-25B	SE	191
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P0100BA	CS 92BZ	EM	187
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P0100DA	CS 92DZ	EM	187
P0100DB	CS 55DZ	EM	187
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P0102AB	CS 55B	EM	187
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P0102BA	CS 92B	EM	187
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P0102BD	CS 18B	EM	188
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P0103CA			*
P0103CB			*
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P0103DB			*

* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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P0104CB	CS 55DZ	EM	187
P0104DA	CS 92DZ	EM	187
P0104DB	CS 55DZ	EM	187
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P0105AB			*
P0105BA			*
P0105BB			*
P0105CA			*
P0105CB			*
P0105DA			*
P0105DB			*
P0107AA			*
P0107AB			*
P0107BA			*
P0107CA			*
P0107DA			*
P0108AA			*
P0108AB			*
P0108BA			*
P0108BB			*
P0108CA			*
P0108CB			*
P0108DA			*
P0108DB			*
P0109AA			*
P0109AB			*
P0109BA			*
P0109BB			*
P0109CA			*
P0109CB			*
P0109DA			*
P0109DB			*
P0110AA			*
P0110AB			*
P0110BA			*
P0110BB			*
P0110CA			*
P0110CB			*
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PB305	CBR 3-P010	EM	175
PB305F	CBR 3F-P010	EM	179
PB310	CBR 3-P100	EM	175
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PB605	CBR 6-010	EM	175
PB605F	CBR 6F-010	EM	180
PB610	CBR 6-100	EM	175
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PD 05	CBR 2-L010M	EM	175
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PE 40	CBR 4-L040	CE	175
PE 60	CBR 4-L060	CE	175
PE 80	CBR 4-L080	CE	175
PE100	CBR 4-L100	CE	175
PF 05	CBR 1-010	EM	175
PF 10	CBR 1-010	EM	175
PF 20	CBR 1-020	EM	175
PF 40	CBR 1-040	EM	175
PF 60	CBR 1-060	EM	175
PF 80	CBR 1-080	EM	175
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PK 40	CBR10-J040	SM	176
PK 60	CBR10-J060	SM	176
PK 80	CBR10-J080	SM	176
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PL 20	CBR 1-D020	EM	174
PL 40	CBR 1-D040	EM	174
PL 60	CBR 1-D060	EM	174
PL 80	CBR 1-D080	EM	174
PL100	CBR 1-D100	EM	174
PM05	CBR 6-010	SM	175
PM10	CBR 6-010	SM	175
PM20	CBR 6-020	SM	175
PM40	CBR 6-040	SM	175
PM60	CBR 6-060	SM	175
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PMBT2222A	CMPT2222A	EM	50
PMBT2369	CMPT2369	EM	50
PMBT2907	CMPT2907A	EM	50
PMBT2907A	CMPT2907A	EM	50
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PMBT3904	CMPT3904	EM	50
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PMBT4126	CMPT3906	SE	50
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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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PMBT6429	CMPT6429	EM	50
PMBTA05	CMPTA06	EM	50
PMBTA06	CMPTA06	EM	50
PMBTA13	CMPTA13	EM	51
PMBTA14	CMPTA14	EM	51
PMBTA20	CMPT3904	EM	50
PMBTA42	CMPTA42	EM	51
PMBTA43	CMPTA42	EM	51
PMBTA55	CMPTA56	EM	50
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PMBTA63	CMPTA63	EM	51
PMBTA64	CMPTA64	EM	51
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PN5131			89
PN5132			89
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PN5134			89
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PN5138			89
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PN5143			89
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PP10	CBR 6-010	EM	175
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PP60	CBR 6-060	EM	175
PP80	CBR 6-080	EM	175
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PRLL5817	CMSH1-20M	CE	63
PRLL5818	CMSH1-40M	CE	63
PRLL5819	CMSH1-40M	CE	63
PS05	CBR 6-010	SM	175
PS10	CBR 6-010	SM	175
PS20	CBR 6-020	SM	175
PS40	CBR 6-040	SM	175
PS60	CBR 6-060	SM	175
PS80	CBR 6-080	SM	175
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PV10	CBR 3-P010	EM	175
PV20	CBR 3-P020	EM	175
PV40	CBR 3-P040	EM	175
PV60	CBR 3-P060	EM	175
PV80	CBR 3-P080	EM	175
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PXT2222A	CXT2222A	EM	53
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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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PXTA42	CXTA42	EM	53
PXTA64	CXTA64	EM	53
PXTA92	CXTA92	EM	53
PY05	CBR10-J010	SM	176
PY10	CBR10-J010	SM	176
PY20	CBR10-J020	SM	176
PY40	CBR10-J040	SM	176
PY60	CBR10-J060	SM	176
PY80	CBR10-J080	SM	176
PZT2222	CZT2222A	EM	54
PZT2222A	CZT2222A	EM	54
PZT2907	CZT2907A	EM	54
PZT2907A	CZT2907A	EM	54
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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
SE	Exact mechanical equivalent, slight electrical differences.	**SM**	Exact electrical equivalent, slight mechanical differences.

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* Special Order

CE	Closest equivalent (slight to significant electrical and/or mechanical differences)	**EM**	Exact electrical and mechanical.
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Surface Mounted Devices

Power Dissipation

Power dissipation of a surface mounted discrete semiconductor is dependent on many factors among which are, substrate material/ thickness, bonding pad surface area/thickness, and proximity of the device to other components. The most critical of these is substrate material. Due to these variables, power dissipation is listed below as a range.

CASE	POWER DISSIPATION RANGE
DPAK	12.5W - 20W
SOT-23	200mW - 400mW
SOT-89	400mW - 1600mW
SOT-143	200mW - 400mW
SOT-223	1000mW - 2000mW
SOD-80	350mW - 600mW
MELF	900mW - 1200mW
SMA	1000mW - 2000mW
SMB	1000mW - 2000mW

The low end of the power dissipation range relates to device dissipation in 'free air @ T_A= 25°C." The upper end of the range relates to optimum dissipation levels which are attainable when the SMD is mounted on an alumina (ceramic) substrate.

Midrange dissipation levels are for traditional glass-epoxy PC boards (FR-4 material).

It is important that the design engineer consider all the factors influencing power dissipation for each application.

Typical Reliability Data, SOT-23 Transistor

TEST	TEST CONDITION	SAMPLE SIZE	UNIT HOURS	NO. FAILURES	FAILURE RATE (1) (%/1000 HRS)
OPERATING LIFE (LOAD LIFE)	T_A=25°C, P=P_D MAX V_{CB}=80% V_{CB} MAX t=1000 hours	1160	$1.16x10^6$	1	0.18
HIGH TEMPERATURE STORAGE LIFE	T_A=150°C t=1000 hours	1160	$1.16x10^6$	0	0.08
HIGH TEMPERATURE REVERSE BIAS LIFE	T_A=125°C V_{CB}=80% V_{CB} MAX t=1000 hours	1160	$1.16x10^6$	2	0.27
HUMIDITY LIFE (MOISTURE RESISTANCE)	T_A=85°C, R.H.=85% MIL-STD 202, Method 103B t=1000 hours, Condition B	1160	$1.16x10^6$	2	0.27
TEMPERATURE CYCLING (THERMAL SHOCK)	T_L=-55°C, T_H=150°C t_L=t_H=30 min $t_{TRANSFER}$=2 min. max @ T_A=25°C 5 cycles	1160	--	1	--
PRESSURE COOKER (MOISTURE RESISTANCE)	T_A=122°C, P=2 atmos. 6 hours per cycle 5 cycles (30 hours total)	1160	--	2	--
SOLDERING HEAT (THERMAL SHOCK)	T_A=260°±5°C, 60Sn/40Pb total immersion $t_{IMMERSION}$=10^{+2}_{0} sec	360	--	2	--

(1) 60% CONFIDENCE LEVEL

Typical Reliability Data (Continued)

SOT-23 Silicon Diode

TEST	TEST CONDITION	SAMPLE SIZE	UNIT HOURS	NO. FAILURES	FAILURE RATE (1) (%/1000 HRS)
OPERATING LIFE (LOAD LIFE)	T_A=25°C, I_O=80% I_O Rated V_R=80% V_R Rated t=1000 hours	60	$6x10^4$	0	1.5
HIGH TEMPERATURE STORAGE LIFE	T_A=150°C t=1000 hours	60	$6x10^4$	1	3.4
HIGH TEMPERATURE REVERSE BIAS LIFE	T_A=125°C V_R=80% V_R Rated t=1000 hours	60	$6x10^4$	1	3.4
HUMIDITY LIFE (MOISTURE RESISTANCE)	T_A=85°C, R.H.=85% MIL-STD 202, Method 103B t=1000 hours, Condition B	60	$6x10^4$	0	1.5
TEMPERATURE CYCLING (THERMAL SHOCK)	T_L=-55°C, T_H=150°C t_L=t_H=30 min tTRANSFER=2 min max @ T_A=25°C 5 cycles	60	--	0	--
PRESSURE COOKER (MOISTURE RESISTANCE)	T_A=122°C, P=2 atmos. 6 hours per cycle 5 cycles (30 hours total)	60	--	0	--
SOLDERING HEAT (THERMAL SHOCK)	T_A=260°±5°C, 60Sn/40Pb total immersion tIMMERSION=10^{+2}_{-0}sec	360	--	2	--

(1) 60% CONFIDENCE LEVEL

SOT-23 Zener Diode

TEST	TEST CONDITION	SAMPLE SIZE	UNIT HOURS	NO. FAILURES	FAILURE RATE (1) (%/1000 HRS)
OPERATING LIFE	T_A=25°C, P=P_D MAX t=1000 hours	60	$6x10^4$	0	1.5
HIGH TEMPERATURE STORAGE LIFE	T_A=150°C t=1000 hours	60	$6x10^4$	0	1.5
HUMIDITY LIFE (MOISTURE RESISTANCE)	T_A=85°C, R.H.=85% MIL-STD 202, Method 103B t=1000 hours, Condition B	60	$6x10^4$	1	3.4
TEMPERATURE CYCLING (THERMAL SHOCK)	T_L=-55°C, T_H=150°C t_L=t_H=30 min tTRANSFER=2 min max @ T_A=25°C 5 cycles	60	--	0	--
PRESSURE COOKER (MOISTURE RESISTANCE)	T_A=122°C, P=2 atmos. 6 hours per cycle 5 cycles (30 hours total)	60	--	0	--
SOLDERING HEAT (THERMAL SHOCK)	T_A=260°±5°C, 60Sn/40Pb total immersion tIMMERSION=10^{+2}_{-0}sec	360	--	2	--

(1) 60% CONFIDENCE LEVEL

Small Signal Transistors U.S. Specification (Preferred Series)

SOT-23 Case, 350mW

TYPE NO.	BV_{CBO} (V) MIN	BV_{CEO} *BV_{CES} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CB} *I_{CES} (nA) MAX	(V)	h_{FE} MIN	h_{FE} MAX	@ V_{CE} (V)	@ I_C (mA)	V_{CE}(SAT) @ I_C (V) MAX	(mA)	C_{ob} (pF) MAX	f_T (MHz) MIN	NF (dB) MAX	t_{OFF} (ns) MAX
General Purpose Amplifier/Switches Devices are listed in order of descending breakdown voltage.															
NPN															
CMPT8099	80	80	6.0	100	80	100	300	5.0	1.0	0.4	100	6.0	150	-	-
CMPT930	45	45	5.0	10	45	100	300	5.0	0.01	1.0	10	8.0	30	3.0	-
CMPT2222A	75	40	6.0	10	60	100	300	10	150	1.0	500	8.0	300	4.0	285
CMPT3904	60	40	6.0	50*	30	100	300	1.0	10	0.3	50	4.0	300	5.0	250
CMPT4401	60	40	6.0	100*	35	100	300	1.0	150	0.75	500	6.5	200	-	255
PNP															
CMPT8599	80	80	5.0	100	80	100	300	5.0	1.0	0.4	100	4.5	150	-	-
CMPT2907A	60	60	5.0	10	50	100	300	10	150	1.6	500	8.0	200	-	100
CMPT3906	40	40	5.0	50*	30	100	300	1.0	10	0.4	50	4.5	250	4.0	300
CMPT4403	40	40	5.0	100*	35	100	300	2.0	150	0.75	500	8.5	200	-	255
Saturated Switches Devices are listed in order of descending f_T.															
NPN															
CMPT2369	40	15	4.5	400	20	40	120	1.0	10	0.25	10	4.0	500	-	18
CMPT3646	40	15	5.0	500*	20	15	-	1.0	300	0.5	300	5.0	350	-	28
PNP															
CMPT3640	12	12	4.0	10*	6.0	30	120	0.3	10	0.5	50	3.5	300	-	60
Low Noise Amplifiers Devices are listed in order of ascending NF.															
NPN															
CMPT5089	30	25	4.5	50	15	400	1,200	5.0	0.1	0.5	10	4.0	50	2.0	-
CMPT2484	60	60	6.0	10	45	250	-	5.0	1.0	0.35	1.0	6.0	-	3.0	-
CMPT5088	35	30	4.5	50	20	300	900	5.0	0.1	0.5	10	4.0	50	3.0	-
CMPT6428	60	50	6.0	10	30	250	650	5.0	0.1	0.6	100	3.0	100	-	-
CMPT6429	55	45	6.0	10	30	500	1,250	5.0	0.1	0.6	100	3.0	100	-	-
PNP															
CMPT5087	50	50	3.0	50	35	250	800	5.0	0.1	0.3	10	4.0	40	2.0	-
CMPT5086	50	50	3.0	50	35	150	500	5.0	0.1	0.3	10	4.0	40	3.0	-
High Current Devices are listed in order of descending breakdown voltage.															
NPN															
CMPT3019	120	80	7.0	10	90	100	300	10	150	0.5	500	12	100	4.0	-
CMPTA06	80	80	4.0	100	80	50	-	1.0	100	0.25	100	-	100	-	-
PNP															
CMPT4033	80	80	5.0	50	60	100	300	5.0	100	0.5	500	20	100	-	-
CMPTA56	80	80	4.0	100	80	50	-	1.0	100	0.25	100	-	50	-	-

Small Signal Transistors U.S. Specification (Preferred Series)
SOT-23 Case, 350mW (Continued)

TYPE NO.	BV_{CBO} (V) MIN	BV_{CEO} *BV_{CES} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CB} *I_{CES} (nA) MAX	(V)	h_{FE} @ V_{CE} (V) MIN	MAX	@ I_C (mA)		$V_{CE(SAT)}$ @ I_C (V) MAX	(mA)	C_{ob} (pF) MAX	f_T (MHz) MIN	NF (dB) MAX	t_{OFF} (ns) MAX
High Voltage Devices are listed in order of descending breakdown voltage.															
NPN															
CMPTA44	450	400	6.0	100	400	30	200	10	10	0.75	50	7.0	20	-	-
CMPT6517	350	350	5.0	50	250	30	200	10	30	1.0	50	6.0	40	-	-
CMPTA42	300	300	6.0	100	200	40	-	10	30	0.5	20	3.0	50	-	-
CMPT5551	180	160	6.0	50	120	80	250	5.0	10	0.2	50	6.0	100	8.0	-
PNP															
CMPT6520	350	350	5.0	50	250	30	200	10	30	1.0	50	6.0	40	-	-
CMPTA92	300	300	5.0	250	200	25	-	10	30	0.5	20	6.0	50	-	-
CMPT5401	160	150	5.0	50	120	60	240	5.0	10	0.5	50	6.0	100	8.0	-
RF Oscillator Devices are listed in order of descending f_T.															
NPN															
CMPT5179	20	12	2.5	20	15	25	250	1.0	3.0	0.4	10	1.0	900	4.5	-
CMPTH10	30	25	3.0	100	25	60	-	10	4.0	0.5	4.0	0.7	650	-	-
CMPT918	30	15	3.0	10	15	20	-	1.0	3.0	0.4	10	1.7	600	6.0	-
Darlington Devices are listed in order of descending h_{FE}.															
NPN															
CMPT6427	40	40	12	50	30	20,000	200,000	5.0	100	1.5	500	7.0	130	10	-
CMPTA14	30	30*	10	100	30	20,000	-	5.0	100	1.5	100	-	125	-	-
CMPTA13	30	30*	10	100	30	10,000	-	5.0	100	1.5	100	-	125	-	-
CMPTA27	60	60*	10	100	50	10,000	-	5.0	100	1.5	100	-	125	-	-
NEW CMPTA29	100	100	12	100	80	10,000	-	5.0	100	1.5	100	8.0	125	-	-
PNP															
CMPTA64	30	30*	10	100	30	20,000	-	5.0	100	1.5	100	-	125	-	-
CMPTA63	30	30*	10	100	30	10,000	-	5.0	100	1.5	100	-	125	-	-

Shaded areas indicate Darlington.

2/3 The Size of SOT-23 Case!

NEW SUPER mini™

Small Signal Transistors
SOT-323 Case, 250mW

TYPE NO.	DESCRIPTION	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CB} *I_{CEV} (nA) MAX	(V)	h_{FE} MIN	MAX	@ V_{CE} (V)	@ I_C (mA)	$V_{CE(SAT)}$ @ I_C (V) MAX	(mA)	C_{ob} (pF) MAX	f_T (MHz) MIN	NF (dB) MAX
CMST2222A	NPN AMPL/SWITCH	75	40	6.0	10	60	100	300	10	150	1.0	500	8.0	300	4.0
CMST2907A	PNP AMPL/SWITCH	60	60	5.0	10	50	100	300	10	150	1.6	500	8.0	200	-
CMST3904	NPN AMPL/SWITCH	60	40	6.0	50*	30	100	300	1.0	10	0.3	50	4.0	300	5.0
CMST3906	PNP AMPL/SWITCH	40	40	5.0	50*	30	100	300	1.0	10	0.4	50	4.5	250	4.0

Junction FETs

SOT-23 Case

TYPE NO.	BV_{GSS} (V) MIN	I_{DSS} (mA) MIN	I_{DSS} (mA) MAX	$V_{GS(OFF)}$ (V) MIN	$V_{GS(OFF)}$ (V) MAX	$r_{DS(ON)}$ (Ω) MAX	NF **TYP (dB) MAX	t_{off} (ns) MAX
Amplifiers								
N Channel								
CMPF4416A	35	5.0	15	2.5	6.0	-	2.0	-
CMPF5484*	25	1.0	5.0	0.3	3.0	-	3.0	-
CMPF5485	25	4.0	10	0.5	4.0	-	2.0	-
CMPF5486*	25	8.0	20	2.0	6.0	-	2.0	-
CMPFJ310*	25	24	60	2.0	6.5	-	1.5**	-
P Channel								
CMPF5460*	40	1.0	5.0	0.75	6.0	-	2.5	-
CMPF5461*	40	2.0	9.0	1.0	7.5	-	2.5	-
CMPF5462*	40	4.0	16	1.8	9.0	-	2.5	-
Switches / Choppers								
N Channel								
CMPF4391	40	50	150	4.0	10	30	-	20
CMPF4392	40	25	75	2.0	5.0	60	-	35
CMPF4393	40	5.0	30	0.5	3.0	100	-	50
P Channel								
CMPFJ174*	30	2.0	100	5.0	10	85	-	-
CMPFJ175*	30	7.0	60	3.0	6.0	125	-	-
CMPFJ176*	30	2.0	25	1.0	4.0	250	-	-

*Available on special order, consult factory.

Small Signal MOSFET

SOT-23 Case

TYPE NO.	$r_{DS(ON)}$ @ I_D (Ω) MAX	I_D (A)	$V_{GS(th)}$ (V) MIN	$V_{GS(th)}$ (V) MAX	BV_{DSS} (V) MIN	C_{iss} (pF) MAX	C_{rss} (pF) MAX	t_{on} (ns) MAX	t_{off} (ns) MAX
2N7002	7.5	0.5	1.0	2.5	60	50	5.0	20	20

Small Signal Transistors

SOT-89 Case, 1.2W

TYPE NO.	BV_{CBO} (V) MIN	BV_{CEO} *BV_{CES} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CB} *I_{CES} (nA) MAX	(V)	h_{FE} MIN	h_{FE} MAX	@ V_{CE} (V)	@ I_C (mA)	$V_{CE}(SAT)$ @ I_C (V) MAX	(mA)	C_{ob} (pF) MAX	f_T (MHz) MIN	NF (dB) MAX	t_{OFF} (ns) MAX
General Purpose Amplifier/Switches Devices are listed in order of descending breakdown voltage.															
NPN															
CXT2222A	75	40	6.0	10	60	100	300	10	150	1.0	500	8.0	300	4.0	285
CXT3904	60	40	6.0	50*	30	100	300	1.0	10	0.3	50	4.0	300	5.0	250
PNP															
CXT2907A	60	60	5.0	10	50	100	300	10	150	1.6	500	8.0	200	-	100
CXT3906	60	40	6.0	50*	30	100	300	1.0	10	0.3	50	4.0	300	5.0	250
High Current Devices are listed in order of descending breakdown voltage.															
NPN															
CXT3019	140	80	7.0	10	90	100	300	10	150	0.5	500	12	100	4.0	-
CBCX68	25	20	5.0	100	25	85	375	1.0	500	0.5	1,000	-	65	-	-
PNP															
CXT4033	80	80	5.0	50	60	100	300	5.0	100	0.5	500	20	100	-	-
CBCX69	25	20	5.0	100	25	85	375	1.0	500	0.5	1,000	-	65	-	-
High Voltage Devices are listed in order of descending breakdown voltage.															
NPN															
CXTA42	300	300	6.0	100	200	40	-	10	30	0.5	20	4.0	50	-	-
CXT5551	180	160	6.0	50	120	80	250	5.0	10	0.2	50	6.0	100	8.0	-
PNP															
CXTA92	300	300	5.0	250	200	25	-	10	30	0.5	20	6.0	50	-	-
CXT5401	160	150	5.0	50	120	60	240	5.0	10	0.5	50	6.0	100	8.0	-
Darlington Devices are listed in order of descending h_{FE}.															
NPN															
CXTA14	30	30*	10	100	30	20,000	-	5.0	100	1.5	100	-	125	-	-
CXTA27	60	60*	10	100	50	10,000	-	5.0	100	1.5	100	-	-	-	-
PNP															
CXTA64	30	30*	10	100	30	20,000	-	5.0	100	1.5	100	-	100	-	-

Shaded areas indicate Darlington.

Small Signal Transistors

SOT-223 Case, 2.0W

TYPE NO.	BV_{CBO}	BV_{CEO} *BV_{CES}	BV_{EBO}	I_{CBO} @ V_{CB} *I_{CES}		h_{FE}		@ V_{CE}	@ I_C	V_{CE}(SAT) @ I_C		C_{ob}	f_T	NF	t_{OFF}
	(V) MIN	(V) MIN	(V) MIN	(nA) MAX	(V)	MIN	MAX	(V)	(mA)	(V) MAX	(mA)	(pF) MAX	(MHz) MIN	(dB) MAX	(ns) MAX
General Purpose Amplifier/Switches Devices are listed in order of descending breakdown voltage.															
NPN															
CZT2222A	75	40	6.0	10	60	100	300	10	150	1.0	500	8.0	300	4.0	285
CZT3904	60	40	6.0	50*	30	100	300	1.0	10	0.3	50	4.0	300	5.0	250
PNP															
CZT2907A	60	60	5.0	10	50	100	300	10	150	1.6	500	8.0	200	-	100
CZT3906	60	40	6.0	50*	30	100	300	1.0	10	0.3	50	4.0	300	5.0	250
High Current Devices are listed in order of descending breakdown voltage.															
NPN															
CZT3019	120	80	7.0	10	90	100	300	10	150	0.5	500	12	100	4.0	-
CBCP68	25	20	5.0	100	25	85	375	1.0	500	0.5	1,000	-	65	-	-
PNP															
CZT4033	80	80	5.0	50	60	100	300	5.0	100	0.5	500	20	100	-	-
CBCP69	25	20	5.0	100	25	85	375	1.0	500	0.5	1,000	-	65	-	-
High Voltage Devices are listed in order of descending breakdown voltage.															
NPN															
CZTA44	450	400	6.0	100	400	50	200	10	10	0.75	50	7.0	20	-	-
CZTA42	300	300	6.0	100	200	40	-	10	30	0.5	20	4.0	50	-	-
CZT5551	180	160	6.0	50	120	80	250	5.0	10	0.2	50	6.0	100	8.0	-
PNP															
CZTA92	300	300	5.0	250	200	25	-	10	30	0.5	200	6.0	50	-	-
CZT5401	160	150	5.0	50	120	60	240	5.0	10	0.5	50	6.0	100	8.0	-
Darlington Devices are listed in order of descending h_{FE}.															
NPN															
CZTA14	30	30*	10	100	30	20,000	-	5.0	100	1.5	100	-	125	-	-
CZT2000	200	200*	10	500	180	3,000	-	5.0	160	1.1	80	-	-	-	-
PNP															
CZTA64	30	30*	10	100	30	20,000	-	5.0	100	1.5	100	-	125	-	-

Shaded areas indicate Darlington.

Note: SOT-223 also mounts directly on DPAK solder pads.

Power Transistors

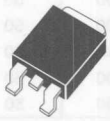
SOT-223 Case

POWER 223™

A Power Transistor Chip in a Small Signal Package!

TYPE NO. NPN	TYPE NO. PNP	DESCRIPTION	I_C (A) MAX	P_D (W)	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	h_{FE} MIN	h_{FE} MAX	@ I_C (A)	$V_{CE(SAT)}$ (V) MAX	@ I_C (A)	f_T (MHz) MIN
CZT31C	CZT32C	AMPL/SWITCH	3.0	2.0	100	100	10	100	3.0	1.2	3.0	3.0
CZT122	CZT127	DARLINGTON	5.0	2.0	100	100	1,000	---	3.0	4.0	5.0	4.0
CZT3055	CZT2955	AMPL/SWITCH	6.0	2.0	100	70	20	70	4.0	1.1	4.0	2.5
CZT5338		HIGH CURRENT SWITCH	5.0	2.0	100	100	30	120	2.0	1.2	5.0	30

Shaded areas indicate Darlington.



Power Transistors

DPAK Case

DPAK POWER!™

TYPE NO. NPN	TYPE NO. PNP	I_C (A)	P_D (W)	BV_{CBO} *BV_{CEV} (V)	BV_{CEO} (V)	h_{FE} MIN	h_{FE} MAX	@ I_C (A)	$V_{CE(SAT)}$ (V) MAX	@ I_C (A)	f_T *TYP (MHz) MIN
General Purpose Amplifier/Switches Devices are listed in order of descending breakdown voltage.											
CJD31C	CJD32C	3.0	15	100	100	10	50	3.0	1.2	3.0	3.0
CJD41C	CJD42C	6.0	20	100	100	15	75	3.0	1.5	6.0	3.0
CJD44H11	CJD45H11	8.0	20	80	80	40	---	4.0	1.0	8.0	50*
CJD3055	CJD2955	10	20	70	60	20	100	4.0	1.1	4.0	2.0
CJD200	CJD210	5.0	12.5	40	25	45	180	2.0	1.8	5.0	65
High Voltage Devices are listed in order of descending breakdown voltage.											
CJD13003		1.5	15	700*	400	5.0	25	1.0	3.0	1.5	4.0
CJD50		1.0	15	500	400	30	150	0.3	1.0	1.0	10
CJD340	CJD350	0.5	15	300	300	30	240	0.05	---	---	---
CJD47		1.0	15	350	250	30	150	0.3	1.0	1.0	10
Darlington											
CJD112	CJD117	2.0	20	100	100	1,000	12,000	2.0	2.0	2.0	25
CJD122	CJD127	8.0	20	100	100	1,000	12,000	4.0	4.0	8.0	4.0

Shaded areas indicate Darlington.

Switching Diodes

TYPE NO.	DESCRIPTION	V_{RRM} (V) MAX	I_O (mA) MAX	V_F @ I_F (V) MAX	(mA)	t_{rr} (ns) MAX
	SOD-80 Case	Devices are listed in order of ascending breakdown voltage.				
CLL4150	HIGH CURRENT,SWITCHING DIODE	50	300	1.0	200	4.0
CLL914	SWITCHING DIODE	100	200	1.0	10	4.0
CLL4448	SWITCHING DIODE	100	200	1.0	100	4.0
CLL2003	HIGH VOLTAGE SWITCHING DIODE	250	250	1.0	100	50
	SOT-23 Case	Devices are listed in order of ascending breakdown voltage.				
CMPD4150	SINGLE SWITCHING DIODE	50	300	1.0	200	4.0
CMPD2836	DUAL SWITCHING DIODE, COMMON ANODE	75	200	1.0	50	6.0
CMPD2838	DUAL SWITCHING DIODE, COMMON CATHODE	75	200	1.0	50	6.0
CMPD1001	SINGLE HIGH CURRENT DIODE	90	250	1.0	200	50
CMPD1001A	DUAL HIGH CURRENT DIODE, COMMON ANODE	90	250	1.0	200	50
CMPD1001S	DUAL HIGH CURRENT, IN SERIES	90	250	1.0	200	50
CMPD914	SINGLE SWITCHING DIODE	100	200	1.0	10	4.0
CMPD4448	SINGLE SWITCHING DIODE	100	200	1.0	100	4.0
CMPD7000	DUAL SWITCHING DIODE, IN SERIES	100	200	1.1	100	15
CMPD5001	SINGLE INDUCTIVE LOAD DIODE	120	400	1.0	200	50
CMPD5001S	DUAL INDUCTIVE LOAD DIODE, IN SERIES	120	400	1.0	200	50
CMPD2003	SINGLE HIGH VOLTAGE SWITCHING DIODE	250	200	1.0	100	50
CMPD2004	SINGLE HIGH VOLTAGE SWITCHING DIODE	300	200	1.0	100	50
CMPD2004S	DUAL HIGH VOLTAGE SWITCHING DIODE, IN SERIES	300	200	1.0	100	50
	SOT-143 Case					
BAS56	DUAL HIGH CURRENT DIODE, ISOLATED	60	200	1.0	200	6.0
BAS28	DUAL SWITCHING DIODE, ISOLATED	85	250	1.0	50	6.0
	SOT-323 Case					
CMSD2836	DUAL SWITCHING DIODE, COMMON ANODE	75	200	1.0	50	6.0
CMSD2838	DUAL SWITCHING DIODE, COMMON CATHODE	75	200	1.0	50	6.0
CMSD7000	DUAL SWITCHING DIODE, IN SERIES	100	200	1.0	100	15
CMSD4448	SINGLE SWITCHING DIODE	100	200	1.0	100	4.0

SUPER™ mini

NEW

Stabistor Diode

SOT-23 Case

TYPE NO.	V_F (V) MIN	V_F (V) MAX	@ I_F (mA)	V_F (V) MIN	V_F (V) MAX	@ I_F (mA)	V_F (V) MIN	V_F (V) MAX	@ I_F (mA)	V_F (V) MIN	V_F (V) MAX	@ I_F (mA)	V_F (V) MIN	V_F (V) MAX	@ I_F (mA)
CBAS17	0.580	0.680	0.1	0.665	0.760	1.0	0.725	0.820	5.0	0.750	0.840	10	0.870	0.960	100

Schottky Diodes

TYPE NO.	CONFIGURATION	V_{RRM} (V) MAX	I_F *I_O (mA) MAX	V_F @ I_F (V) MAX	(I_F mA)	t_{rr} (ns) MAX	CT *TYP (pF) MAX
SUPER mini™	 **SOD-323 Case**						
High Current							
CMDSH-3	SINGLE	30	100*	0.55	50	5.0	7.0*
NEW **CMDSH2-3**	SINGLE	30	200*	0.55	200	-	15*
	 **SOT-23 Case**						
Low Current							
CMPD6263	SINGLE	70	15	0.41	1.0	1.0	2.0
CMPD6263A	DUAL, COMMON ANODE	70	15	0.41	1.0	1.0	2.0
CMPD6263C	DUAL, COMMON CATHODE	70	15	0.41	1.0	1.0	2.0
CMPD6263S	DUAL, IN SERIES	70	15	0.41	1.0	1.0	2.0
High Current							
CMPSH-3	SINGLE	30	100	0.45	15	5.0	7.0*
CMPSH-3A	DUAL, COMMON ANODE	30	100	0.45	15	5.0	7.0*
CMPSH-3C	DUAL, COMMON CATHODE	30	100	0.45	15	5.0	7.0*
CMPSH-3S	DUAL, IN SERIES	30	100	0.45	15	5.0	7.0*

Low Leakage Diodes

SOD-80 Case

TYPE NO.	V_{RRM} (V) MAX	I_O (mA) MAX	I_R @ V_{RWN} (nA) MAX	(V_{RWN} V)	V_F @ I_F (V) MAX	(I_F mA)	C_T (pF) MAX
CLL457A	70	200	25	60	1.0	100	6.0
CLL459A	200	200	25	175	1.0	100	8.0
CLL3595	150	150	1.0	125	1.0	200	8.0

Zener Diodes

POWER	250mW		350mW									
	SUPER mini™ NEW											
CASE	SOD-323		PREFERRED		SOT-23							
ZENER VOLTAGE	LOW LEVEL SHARP KNEE	@ I_{ZT} = (μA)	INDUSTRY STANDARD	@ I_{ZT} = (mA)	LOW NOISE LOW LEVEL	@ I_{ZT} = (μA)	LOW LEVEL	@ I_{ZT} = (μA)	PROELECTRON SPECIFICATION	@ I_{ZT} = (mA)	DUAL, COMMON ANODE	@ I_{ZT} = (mA)
1.8					CMPZ4614*	250	CMPZ4678*	50				
2.0					CMPZ4615*	250	CMPZ4679*	50				
2.2					CMPZ4616*	250	CMPZ4680*	50				
2.4			CMPZ5221B	20	CMPZ4617*	250	CMPZ4681*	50				
2.5			CMPZ5222B	20								
2.7			CMPZ5223B	20	CMPZ4618*	250	CMPZ4682*	50				
2.8			CMPZ5224B	20								
3.0			CMPZ5225B	20	CMPZ4619*	250	CMPZ4683*	50				
3.3			CMPZ5226B	20	CMPZ4620*	250	CMPZ4684*	50	BZX84C3V3	5.0		
3.6			CMPZ5227B	20	CMPZ4621*	250	CMPZ4685*	50	BZX84C3V6	5.0	CMPZDA3V6	5.0
3.9			CMPZ5228B	20	CMPZ4622*	250	CMPZ4686*	50	BZX84C3V9	5.0	CMPZDA3V9	5.0
4.3			CMPZ5229B	20	CMPZ4623*	250	CMPZ4687*	50	BZX84C4V3	5.0	CMPZDA4V3	5.0
4.7			CMPZ5230B	20	CMPZ4624*	250	CMPZ4688*	50	BZX84C4V7	5.0	CMPZDA4V7	5.0
5.1	CMDZ5L1	500	CMPZ5231B	20	CMPZ4625*	250	CMPZ4689*	50	BZX84C5V1	5.0	CMPZDA5V1	5.0
5.6	CMDZ5L6	500	CMPZ5232B	20	CMPZ4626*	250	CMPZ4690*	50	BZX84C5V6	5.0	CMPZDA5V6	5.0
6.0			CMPZ5233B	20								
6.2	CMDZ6L2	500	CMPZ5234B	20	CMPZ4627*	250	CMPZ4691*	50	BZX84C6V2	5.0	CMPZDA6V2	5.0
6.8	CMDZ6L8	500	CMPZ5235B	20			CMPZ4692*	50	BZX84C6V8	5.0	CMPZDA6V8	5.0
7.5	CMDZ7L5	500	CMPZ5236B	20			CMPZ4693*	50	BZX84C7V5	5.0	CMPZDA7V5	5.0
8.2	CMDZ8L2	500	CMPZ5237B	20			CMPZ4694*	50	BZX84C8V2	5.0	CMPZDA8V2	5.0
8.7			CMPZ5238B	20			CMPZ4695*	50				
9.1	CMDZ9L1	500	CMPZ5239B	20			CMPZ4696*	50	BZX84C9V1	5.0	CMPZDA9V1	5.0
10	CMDZ10L	500	CMPZ5240B	20			CMPZ4697*	50	BZX84C10	5.0	CMPZDA10V	5.0
11	CMDZ11L	500	CMPZ5241B	20			CMPZ4698*	50	BZX84C11	5.0	CMPZDA11V	5.0
12	CMDZ12L	500	CMPZ5242B	20			CMPZ4699*	50	BZX84C12	5.0	CMPZDA12V	5.0
13	CMDZ13L	500	CMPZ5243B	9.5			CMPZ4700*	50	BZX84C13	5.0	CMPZDA13V	5.0
14			CMPZ5244B	9.0			CMPZ4701*	50				
15	CMDZ15L	500	CMPZ5245B	8.5			CMPZ4702*	50	BZX84C15	5.0	CMPZDA15V	5.0
16	CMDZ16L	500	CMPZ5246B	7.8			CMPZ4703*	50	BZX84C16	5.0	CMPZDA16V	5.0
17			CMPZ5247B	7.4			CMPZ4704*	50	BZX84C18	5.0	CMPZDA18V	5.0
18	CMDZ18L	500	CMPZ5248B	7.0			CMPZ4705*	50				
19			CMPZ5249B	6.6			CMPZ4706*	50				
20	CMDZ20L	500	CMPZ5250B	6.2			CMPZ4707*	50	BZX84C20	5.0	CMPZDA20V	5.0
22	CMDZ22L	500	CMPZ5251B	5.6			CMPZ4708*	50	BZX84C22	5.0	CMPZDA22V	5.0
24	CMDZ24L	500	CMPZ5252B	5.2			CMPZ4709*	50	BZX84C24	5.0	CMPZDA24V	5.0
25			CMPZ5253B	5.0			CMPZ4710*	50				
27	CMDZ27L	500	CMPZ5254B	4.6			CMPZ4711*	50	BZX84C27	2.0	CMPZDA27V	2.0
28			CMPZ5255B	4.5			CMPZ4712*	50				
30	CMDZ30L	500	CMPZ5256B	4.2			CMPZ4713*	50	BZX84C30	2.0	CMPZDA30V	2.0
33	CMDZ33L	500	CMPZ5257B	3.8			CMPZ4714*	50	BZX84C33	2.0	CMPZDA33V	2.0
36	CMDZ36L	500	CMPZ5258B	3.4			CMPZ4715*	50				
39			CMPZ5259B	3.2			CMPZ4716*	50				
43			CMPZ5260B	3.0			CMPZ4717*	50				
47			CMPZ5261B	2.7								

* Available on special order; consult factory.

Zener Diodes (Continued)

POWER	500mW						1.0W		1.5W	
CASE	PREFERRED		SOD-80				MELF		SMA	
ZENER VOLTAGE	INDUSTRY STANDARD	@ I_{ZT} = (mA)	LOW LEVEL LOW NOISE	@ I_{ZT} = (μA)	LOW LEVEL	@ I_{ZT} = (μA)	GENERAL PURPOSE	@ I_{ZT} = (mA)	1.5W ZENER 200W TVS	@ I_{ZT} = (mA)
1.8			CLL4614*	250	CLL4678	50				
2.0			CLL4615*	250	CLL4679	50				
2.2			CLL4616*	250	CLL4680	50				
2.4			CLL4617*	250	CLL4681	50				
2.7			CLL4618*	250	CLL4682	50				
3.0			CLL4619*	250	CLL4683	50				
3.3	CLL5226B	20	CLL4620*	250	CLL4684	50				
3.6	CLL5227B	20	CLL4621*	250	CLL4685	50	CLL4729A	69		
3.9	CLL5228B	20	CLL4622*	250	CLL4686	50	CLL4730A	64		
4.3	CLL5229B	20	CLL4623*	250	CLL4687	50	CLL4731A	58		
4.7	CLL5230B	20	CLL4624*	250	CLL4688	50	CLL4732A	53		
5.1	CLL5231B	20	CLL4625*	250	CLL4689	50	CLL4733A	49		
5.6	CLL5232B	20	CLL4626*	250	CLL4690	50	CLL4734A	45		
6.0	CLL5233B	20								
6.2	CLL5234B	20	CLL4627*	250	CLL4691	50	CLL4735A	41		
6.8	CLL5235B	20			CLL4692	50	CLL4736A	37	CMZ5921B	55.1
7.5	CLL5236B	20			CLL4693	50	CLL4737A	34	CMZ5922B	50.0
8.2	CLL5237B	20			CLL4694	50	CLL4738A	31	CMZ5923B	45.7
8.7	CLL5238B	20			CLL4695	50				
9.1	CLL5239B	20			CLL4696	50	CLL4739A	28	CMZ5924B	41.2
10	CLL5240B	20			CLL4697	50	CLL4740A	25	CMZ5925B	37.5
11	CLL5241B	20			CLL4698	50	CLL4741A	23	CMZ5926B	34.1
12	CLL5242B	20			CLL4699	50	CLL4742A	21	CMZ5927B	31.2
13	CLL5243B	9.5			CLL4700	50	CLL4743A	19	CMZ5928B	28.8
14	CLL5244B	9.0			CLL4701	50				
15	CLL5245B	8.5			CLL4702	50	CLL4744A	17	CMZ5929B	25.0
16	CLL5246B	7.8			CLL4703	50	CLL4745A	15.5	CMZ5930B	23.4
17	CLL5247B	7.4			CLL4704	50				
18	CLL5248B	7.0			CLL4705	50	CLL4746A	14	CMZ5931B	20.8
19	CLL5249B	6.6			CLL4706	50				
20	CLL5250B	6.2			CLL4707	50	CLL4747A	12.5	CMZ5932B	18.7
22	CLL5251B	5.6			CLL4708	50	CLL4748A	11.5	CMZ5933B	17.0
24	CLL5252B	5.2			CLL4709	50	CLL4749A	10.5	CMZ5934B	15.6
25	CLL5253B	5.0			CLL4710	50				
27	CLL5254B	4.6			CLL4711	50	CLL4750A	9.5	CMZ5935B	13.9
28	CLL5255B	4.5			CLL4712	50				
30	CLL5256B	4.2			CLL4713	50	CLL4751A	8.5	CMZ5936B	12.5
33	CLL5257B	3.8			CLL4714	50	CLL4752A	7.5	CMZ5937B	11.4
36					CLL4715	50	CLL4753A*	7.0	CMZ5938B	10.4
39					CLL4716	50	CLL4754A*	6.5	CMZ5939B	9.6
43					CLL4717	50	CLL4755A*	6.0	CMZ5940B	8.7
47							CLL4756A*	5.5	CMZ5941B	8.0
51							CLL4757A*	5.0	CMZ5942B	7.3
56							CLL4758A*	4.5	CMZ5943B	6.7
62							CLL4759A*	4.0	CMZ5944B	6.0
68							CLL4760A*	3.7	CMZ5945B	5.5
75							CLL4761A*	3.3	CMZ5946B	5.0
82							CLL4762A*	3.0	CMZ5947B	4.6
91							CLL4763A*	2.8	CMZ5948B	4.1
100							CLL4764A*	2.5	CMZ5949B†	3.7

* Available on special order; consult factory.

† CMZ5950B thru CMZ5956B, 110V thru 200V also available

Current Limiting Diodes

SOD-80 Case

MAXIMUM RATINGS (T_L = 75°C)	SYMBOL		UNITS
Peak Operating Voltage	POV	100	V
Power Dissipation	P_D	800	mW
Operation and Storage Junction Temperature	T_J,T_{stg}	-65 to + 200	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

TYPE NO.	REGULATOR CURRENT (1) I_P@V_T=25V (mA)			DYNAMIC IMPEDANCE Z_T@V_T=25V (MΩ)	KNEE IMPEDANCE Z_K@V_K=6.0V (MΩ)	LIMITING VOLTAGE V_L@I_L=0.8 I_P MIN (V)
	MIN	NOM	MAX	MIN	MIN	MAX
CCLM0035	0.010	0.035	0.060	8.0	4.00	0.4
CCLM0130	0.050	0.130	0.210	6.0	2.00	0.6
CCLM0300	0.200	0.310	0.420	4.0	1.00	0.8
CCLM0500	0.400	0.515	0.630	2.0	0.50	1.1
CCLM0750	0.600	0.760	0.920	1.0	0.20	1.4
CCLM1000	0.880	1.100	1.320	0.65	0.10	1.7
CCLM1500	1.280	1.500	1.720	0.45	0.07	2.0
CCLM2000	1.680	2.000	2.320	0.35	0.05	2.3
CCLM2700	2.280	2.690	3.100	0.30	0.03	2.7
CCLM3500	3.000	3.550	4.100	0.25	0.02	3.2
CCLM4500	3.900	4.500	5.100	0.20	0.01	3.7
CCLM5750	5.000	5.750	6.500	0.05	0.005	4.5

High Current, Current Limiting Diodes

SOD-80 Case

MAXIMUM RATINGS (T_L = 75°C)	SYMBOL		UNITS
Peak Operating Voltage	POV	50	V
Power Dissipation	P_D	800	mW
Operation and Storage Junction Temperature	T_J,T_{stg}	-65 to + 200	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

TYPE NO.	REGULATOR CURRENT (1) I_P@V_T=25V (mA)			DYNAMIC IMPEDANCE Z_T@V_T=25V (MΩ)	KNEE IMPEDANCE Z_K@V_K=6.0V (KΩ)	LIMITING VOLTAGE V_L@I_L=0.8 I_PMIN (V)
	MIN	NOM	MAX	MIN	MIN	MAX
CCLHM080	6.56	8.2	9.84	0.32	15	3.1
CCLHM100	8.00	10	12	0.17	6.0	3.5
CCLHM120	9.60	12	14.4	0.08	3.0	3.8
CCLHM150	12	15	18	0.03	2.0	4.3

* The Temperature Coefficient is measured between the following points: +25°C, +50°C

(1) TESTED USING THE PULSED METHOD. $\left(\text{PULSE WIDTH (ms)} = \frac{27.5}{I_P \text{ NOM (mA)}}\right)$

Rectifiers, General Purpose

1.0 to 3.0 Amperes
200 to 1000 Volts

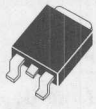
I_O (AMPS)	1.0		2.0	3.0
@ T_A (°C)	25	25	25	25
I_{FSM} (AMPS)	30	30	60	200
CASE	 SMA	 SMB		 SMC
V_{RRM} (VOLTS)				
200	CMR1-02M	CMR1-02	CMR2-02	CMR3-02
400	CMR1-04M	CMR1-04	CMR2-04	CMR3-04
600	CMR1-06M	CMR1-06	CMR2-06	CMR3-06
1000	CMR1-10M	CMR1-10	CMR2-10	CMR3-10

V_F MAX @ $I_F = I_O$	1.1V	1.1V	1.1V	1.2V

I_R MAX @ V_{RRM}	5.0μA	10μA	0.5μA	5.0μA

Rectifiers, Ultra Fast

1.0 to 6.0 Amperes
100 to 600 Volts

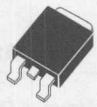
I_O (AMPS)	1.0		2.0	3.0		6.0
@ T_A (°C)	25	25	25	25	25	25
I_{FSM} (AMPS)	30	30	50	150	75	75
CASE	NEW  SMA	 SMB		 SMC	NEW  DPAK	
V_{RRM} (VOLTS)			NEW			
100	CMR1U-01M	CMR1U-01	CMR2U-01	CMR3U-01		
200	CMR1U-02M	CMR1U-02	CMR2U-02	CMR3U-02	CUD3-02	CUD6-02C
400	CMR1U-04M	CMR1U-04	CMR2U-04	CMR3U-04		
600	CMR1U-06M	CMR1U-06	CMR2U-06	CMR3U-06		

V_F MAX @ $I_F = I_O$						
100V	1.0V	1.0V	1.0V	1.0V		
200V	1.0V	1.0V	1.0V	1.0V	1.25V@12A	1.25V@10A
400V	1.25V	1.25V	1.25V	1.25V		
600V	1.4V	1.4V	1.4V	1.4V		

I_R MAX @ V_{RRM}	5.0μA	5.0μA	10μA	5.0μA	20μA	20μA
t_{rr} (100V thru 200V)	35ns	50ns	50ns	50ns	35ns	35ns
t_{rr} (400V)	50ns	50ns	50ns	50ns		
t_{rr} (600V)	75ns	100ns	50ns	100ns		

Rectifiers, Schottky

1.0 to 6.0 Amperes
20 to 60 Volts

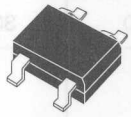
I_O (AMPS)	1.0			2.0		3.0		6.0
@ T_A (°C)	25	25	25	25	25	25	25	25
I_{FSM} (AMPS)	30	30	10	30	10	150	75	75
CASE	 SMA	 SMB	 SOT-89	 SMB	 SOT-223	 SMC	 DPAK	
V_{RRM} (VOLTS)								
20	CMSH1-20M	CMSH1-20		CMSH2-20		CMSH3-20		
40	CMSH1-40M	CMSH1-40	CXSH-4	CMSH2-40	CZSH-4	CMSH3-40	CSHD3-40	CSHD6-40C
60	CMSH1-60M	CMSH1-60		CMSH2-60		CMSH3-60	CSHD3-60	CSHD6-60C
100		CMSH1-100						
V_F MAX @ $I_F = I_O$								
20V	0.5V	0.55V		0.5V		0.5V		
40V	0.5V	0.55V	0.55V	0.5V	0.55V	0.5V	0.84V	0.84V
60V	0.7V	0.7V		0.7V		0.7V	0.65V	0.65V
100V		0.85V						

I_R MAX @ V_{RRM}	500µA	500µA	1000µA	500µA	1000µA	500µA	100µA*	100µA*

* 40 Volt device

Bridge Rectifiers Single Phase, Full Wave

0.5 to 1.0 Ampere 100 to 1000 Volts

I_O (AMPS)	0.5	1.0		
@ T_A (°C)	25	50	50	25
I_{FSM} (AMPS)	30	50	50	50
CASE	HDBRIDGE™  HD DIP	 SMDIP		
V_{RRM} (VOLTS)	GENERAL PURPOSE	GENERAL PURPOSE	FAST RECOVERY	ULTRA FAST RECOVERY
100				CBR1U-D010S
200	CBRHD-02	CBR1-D020S	CBR1F-D020S	CBR1U-D020S
400	CBRHD-04	CBR1-D040S	CBR1F-D040S	
600	CBRHD-06	CBR1-D060S	CBR1F-D060S	
1000	CBRHD-10*	CBR1-D100S	CBR1F-D100S	

V_F MAX @ I_F	1.0V @ 0.4A	1.1V @ 1.0A	1.3V @ 1.0A	1.05V @ 1.0A
I_R MAX @ V_{RRM}	5.0μA	10μA	10μA	10μA
t_{rr}(100V thru 400V)			200ns	50ns
t_{rr}(600V)			300ns	
t_{rr}(1000V)			500ns	

* Available on special order only, consult factory.

SCRs (Silicon Controlled Rectifiers)

0.8 Ampere RMS
400 Volts

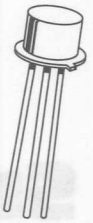
I_T (AMPS)	0.8
@ T_C (°C)	67
I_{TSM} (AMPS)	10
CASE	 SOT-23
V_{RRM} (VOLTS)	
400	CMPS5064

I_{GT}	200μA
V_{GT}	0.8V
I_H	5.0mA

Small Signal Transistors

Small Signal Transistors

TO-18 Case



TYPE NO.	DESCRIPTION	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (μA) MAX *I_{CES} **I_{CEV}	(V_{CBO}) (V)	h_{FE} MIN	h_{FE} MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V) MAX	@ I_C (mA)	C_{ob} (pF) MAX	f_T (MHZ) MIN	NF (dB) MAX	t_{on} (ns) MAX	t_{off} (ns) MAX
2N703	NPN AMPL/SWITCH	25	25	5.0	---	---	40	100	10	10	0.5	10	5.0	70	---	---	---
2N706C	NPN SAT SWITCH	40	15	5.0	0.5	15	20	60	10	5.0	0.3	30	5.0	200	---	40	75
2N708	NPN SAT SWITCH	40	15	5.0	0.025	20	30	120	10	1.0	0.4	10	6.0	400	---	40	70
2N709A	NPN SAT SWITCH	15	6.0	4.0	0.005	5.0	30	90	10	0.5	0.3	3.0	3.0	900	---	15	15
2N717	NPN AMPL/SWITCH	60	40	5.0	---	---	20	60	150	10	1.5	150	35	40	---	---	---
2N718A	NPN AMPL/SWITCH	75	32	7.0	0.01	60	40	120	150	10	1.5	150	25	60	---	---	---
2N719A	NPN AMPL/SWITCH	120	60	7.0	0.01	75	20	60	150	10	5.0	150	15	40	---	---	---
2N720A	NPN AMPL/SWITCH	120	80	7.0	0.01	90	40	120	150	10	5.0	150	15	50	---	---	---
2N721	PNP AMPL/SWITCH	50	35	5.0	1.0	30	20	45	150	10	1.5	150	45	50	---	---	---
2N722A	PNP AMPL/SWITCH	50	35	5.0	0.1	30	30	90	150	10	1.5	150	45	60	---	---	---
2N726	PNP AMPL/SWITCH	25	20	5.0	1.0	25	15	45	10	1.0	0.6	10	5.0	140	---	---	---
2N727	PNP AMPL/SWITCH	25	20	5.0	1.0	25	30	120	10	1.0	0.6	10	5.0	140	---	---	---
2N730	NPN AMPL/SWITCH	60	35	5.0	---	---	20	60	150	10	1.5	150	35	40	---	---	---
2N731	NPN AMPL/SWITCH	60	35	5.0	---	---	40	120	150	10	1.5	150	35	50	---	---	---
2N743A	NPN SAT SWITCH	40	15	5.0	---	---	20	60	10	5.0	0.6	100	4.0	500	---	12	15
2N744A	NPN SAT SWITCH	40	15	5.0	---	---	40	120	10	5.0	0.6	100	4.0	500	---	12	15
2N753	NPN SAT SWITCH	25	20	5.0	0.05	15	40	120	10	1.0	0.6	10	5.0	200	---	40	75
2N760A	NPN LOW NOISE	60	60	8.0	0.1	30	76	333	1.0	5.0	1.0	10	8.0	50	---	---	---
2N783	NPN SAT SWITCH	40	15	5.0	0.25	25	20	60	10	1.0	0.25	10	3.5	200	---	16	30
2N784A	NPN SAT SWITCH	40	15	5.0	---	---	25	150	10	5.0	0.19	10	3.5	300	---	20	40
2N834A	NPN SAT SWITCH	40	25	5.0	0.5	20	25	---	10	1.0	0.25	10	4.0	500	---	16	24
2N835	NPN SAT SWITCH	25	20	5.0	0.5	20	20	---	10	1.0	0.3	10	4.0	300	---	20	35
2N864	PNP AMPL/SWITCH	6.0	6.0	6.0	0.1	10	25	125	1.0	6.0	0.1	5.0	9.0	---	---	---	---
2N865	PNP AMPL/SWITCH	10	6.0	6.0	0.1	10	100	350	1.0	6.0	0.1	5.0	9.0	---	---	---	---
2N869A	PNP AMPL/SWITCH	25	18	5.0	0.01	15	40	120	10	5.0	0.15	10	6.0	400	---	---	---
2N870	NPN AMPL/SWITCH	100	60	7.0	0.01	75	20	120	150	10	5.0	150	15	50	---	---	---
2N871	NPN AMPL/SWITCH	100	60	7.0	0.01	75	100	300	150	10	5.0	150	15	60	---	---	---
2N909	NPN AMPL SWITCH	30	25	5.0	---	---	110	350	50	10	2.0	50	25	50	---	---	---
2N910	NPN AMPL/SWITCH	100	60	7.0	0.025	75	75	---	10	10	1.2	50	15	60	---	---	---
2N911	NPN AMPL/SWITCH	100	60	7.0	0.025	75	35	---	10	10	1.2	50	15	50	---	---	---
2N912	NPN AMPL/SWITCH	100	60	7.0	0.025	75	15	---	10	10	1.2	50	15	40	---	---	---
2N914	NPN SAT SWITCH	40	15	5.0	0.025	20	30	120	10	1.0	0.7	0.8	6.0	60	---	40	40
2N915	NPN RF/IF OSC	70	50	5.0	---	---	50	200	10	10	---	---	3.5	250	---	---	---
2N916	NPN RF/IF OSC	45	45	5.0	---	--	50	200	10	10	---	---	6.0	300	---	---	---
2N929A	NPN LOW NOISE	60	45	6.0	0.02	45	40	120	0.01	5.0	0.5	10	6.0	45	4.0	---	---
2N930B	NPN LOW NOISE	60	45	6.0	0.200	45	100	300	0.01	5.0	0.5	10	6.0	45	3.0	---	---
2N947	NPN SAT SWITCH	15	12	3.0	---	---	30	---	10	1.0	0.4	5.0	8.0	200	---	---	50
2N956	NPN AMPL/SWITCH	75	50	7.0	0.01	60	100	300	150	10	1.5	150	25	70	---	---	---

Small Signal Transistors

TO-18 Case (Continued)

TYPE NO.	DESCRIPTION	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (μA) MAX *I_{CES} **I_{CEV}	(V)	h_{FE} MIN	h_{FE} MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V) MAX	@ I_C (mA)	C_{ob} (pF) MAX	f_T (MHZ) MIN	NF (dB) MAX	t_{on} (ns) MAX	t_{off} (ns) MAX
2N957	NPN RF/IF OSC	40	20	5.0	---	---	45	---	10	10	---	---	6.0	200	---	---	---
2N978	PNP AMPL/SWITCH	30	20	5.0	5.0	10	15	60	150	10	1.5	150	45	40	---	---	---
2N995	PNP SAT SWITCH	20	15	4.0	0.005	15	35	140	20	1.0	0.2	20	10	100	---	65	125
2N996	PNP SAT SWITCH	15	12	4.0	0.005	10	35	---	20	1.0	0.3	60	10	100	---	---	---
2N1991	PNP AMPL/SWITCH	30	20	5.0	5.0	10	15	60	150	10	1.5	150	45	40	---	---	---
2N2205	NPN SAT SWITCH	25	12	3.0	0.025	15	20	---	10	1.0	0.22	10	6.0	200	---	40	75
2N2220	NPN AMPL/SWITCH	60	35	5.0	0.01	50	20	60	150	10	0.4	150	8.0	250	---	---	---
2N2221A	NPN AMPL/SWITCH	75	40	6.0	0.01	60	40	120	150	10	0.3	150	8.0	250	---	---	285
2N2222A	NPN AMPL/SWITCH	75	40	6.0	0.01	60	100	300	150	10	0.3	150	8.0	250	---	---	285
2N2242	NPN SAT SWITCH	15	15	5.0	---	---	40	120	10	1.0	0.3	10	6.0	250	---	---	25
2N2368	NPN SAT SWITCH	40	15	4.0	0.4	20	20	40	10	1.0	0.25	0.85	4.0	400	---	12	15
2N2369A	NPN SAT SWITCH	40	15	4.0	---	---	40	120	10	1.0	0.25	1.5	4.0	500	---	---	18
2N2377	PNP AMPL/SWITCH	25	25	10	1.0	25	15	120	1.0	6.0	---	---	12	---	---	---	---
2N2378	PNP AMPL/SWITCH	10	10	10	0.1	10	15	---	5.0	0.5	0.15	5.0	12	---	---	---	---
2N2411	PNP SAT SWITCH	25	20	5.0	0.01	25	20	60	10	0.5	0.2	10	5.0	200	---	25	100
2N2412	PNP SAT SWITCH	25	20	5.0	0.01	25	40	120	10	0.5	0.2	10	5.0	200	---	25	100
2N2475	NPN SAT SWITCH	15	6.0	4.0	0.5	5.0	30	150	20	0.4	0.4	1.0	3.0	600	---	20	15
2N2483	NPN LOW NOISE	60	60	6.0	0.01	45	40	120	0.01	5.0	0.35	1.0	6.0	60	4.0	---	---
2N2484	NPN LOW NOISE	60	60	6.0	0.01	45	100	500	0.01	5.0	0.35	1.0	6.0	60	2.0	---	---
2N2501	NPN SAT SWITCH	40	20	6.0	---	---	50	150	10	1.0	0.2	10	4.0	350	---	---	---
2N2509	NPN LOW NOISE	124	80	7.0	0.005	100	25	---	0.01	5.0	1.0	5.0	6.0	45	7.0	---	---
2N2510	NPN LOW NOISE	100	65	7.0	0.005	80	150	500	10	5.0	1.0	5.0	6.0	45	4.0	---	---
2N2511	NPN LOW NOISE	80	50	7.0	0.005	60	240	750	10	5.0	1.0	5.0	6.0	45	4.0	---	---
2N2539	NPN SAT SWITCH	60	30	5.0	0.25	40	50	150	150	10	0.45	150	8.0	250	---	40	40
2N2540	NPN SAT SWITCH	60	30	5.0	0.25	40	100	300	150	10	0.45	150	8.0	250	---	40	40
2N2586	NPN LOW NOISE	60	45	6.0	0.200	45	120	360	0.01	5.0	0.5	10	7.0	45	3.0	---	---
2N2645	NPN AMPL/SWITCH	75	40	7.0	0.01	60	100	300	150	10	0.4	10	25	50	---	---	---
2N2651	NPN SAT SWITCH	40	20	5.0	0.03	20	25	---	10	1.0	0.25	10	4.0	350	---	35	75
2N2710	NPN SAT SWITCH	40	20	5.0	0.03	20	40	---	10	1.0	0.25	10	4.0	500	---	20	35
2N2837	PNP AMPL/SWITCH	50	35	5.0	0.1	30	30	---	150	10	1.0	150	25	120	---	---	---
2N2838	PNP AMPL/SWITCH	50	35	5.0	0.1	30	75	---	150	10	1.0	150	25	120	---	---	---
2N2845	NPN SAT SWITCH	60	30	5.0	0.2	30	30	120	150	10	1.0	500	8.0	250	---	40	40
2N2847	NPN SAT SWITCH	60	20	5.0	0.2	30	40	140	150	10	0.75	500	8.0	250	---	25	40
2N2861	PNP LOW NOISE	25	20	5.0	---	---	30	120	0.01	5.0	0.2	10	6.0	200	3.0	---	---
2N2862	PNP LOW NOISE	25	20	5.0	---	---	12	120	0.01	5.0	0.2	10	6.0	150	4.0	---	---
2N2894	PNP SAT SWITCH	12	12	4.0	0.08*	6.0	40	150	30	0.5	0.5	100	6.0	400	---	60	90
2N2894A	PNP SAT SWITCH	12	12	4.0	0.05	10	30	---	10	0.3	0.13	10	4.5	800	---	20	25
2N2895	NPN AMPL/SWITCH	120	65	7.0	---	---	40	120	150	10	0.5	500	15	120	---	---	---

Small Signal Transistors
TO-18 Case (Continued)

TYPE NO.	DESCRIPTION	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (μA) MAX *I_{CES} **I_{CEV}	(V)	h_{FE} MIN	h_{FE} MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ @ I_C (V) MAX	(mA)	C_{ob} (pF) MAX	f_T (MHZ) MIN	NF (dB) MAX	t_{on} (ns) MAX	t_{off} (ns) MAX
2N2896	NPN AMPL/SWITCH	140	90	7.0	---	---	60	200	150	10	0.5	500	15	120	---	---	---
2N2897	NPN AMPL/SWITCH	60	45	7.0	---	---	50	200	150	10	0.5	500	15	100	---	---	---
2N2906A	PNP AMPL/SWITCH	60	60	5.0	0.01	50	40	120	150	10	0.4	150	8.0	200	---	---	180
2N2907A	PNP AMPL/SWITCH	60	60	5.0	0.01	50	100	300	150	10	0.4	150	8.0	200	---	---	180
2N2952	NPN AMPL/SWITCH	60	20	5.0	0.1	50	20	---	150	10	0.5	150	8.0	200	---	---	---
2N3009	NPN SAT SWITCH	40	15	4.0	0.5*	20	30	120	30	0.4	0.5	300	5.0	350	---	15	25
2N3011	NPN SAT SWITCH	30	12	5.0	0.4*	20	30	120	10	0.35	0.5	100	4.0	400	---	15	20
2N3012	PNP SAT SWITCH	12	12	4.0	0.08*	6.0	30	120	30	0.5	0.2	30	6.0	400	---	60	75
2N3013	NPN SAT SWITCH	40	15	5.0	0.3*	20	30	120	30	0.4	0.5	300	5.0	350	---	15	25
2N3014	NPN SAT SWITCH	40	20	5.0	0.3*	20	30	120	30	0.4	0.35	100	5.0	350	---	16	25
2N3073	PNP AMPL/SWITCH	60	60	4.0	0.01*	30	30	130	50	1.0	0.25	50	10	130	---	40	100
2N3115	NPN AMPL/SWITCH	20	20	5.0	---	---	40	120	150	10	0.5	150	8.0	250	---	---	---
2N3116	NPN AMPL/SWITCH	20	20	5.0	---	---	100	300	150	10	0.5	150	8.0	250	---	---	---
2N3117	NPN AMPL/SWITCH	60	60	6.0	0.01	45	250	500	0.01	10	0.35	1.0	4.5	60	---	---	---
2N3121	PNP AMPL/SWITCH	45	45	4.0	0.01	30	30	---	150	10	0.5	150	10	130	---	---	---
2N3135	PNP AMPL/SWITCH	50	35	4.0	0.05	30	40	---	150	10	0.5	150	10	200	---	---	---
2N3136	PNP AMPL/SWITCH	50	35	4.0	0.05	30	100	300	150	10	0.6	150	10	200	---	---	---
2N3209	PNP SAT SWITCH	20	20	4.0	0.08	10	25	---	10	0.3	0.15	10	5.0	400	---	60	90
2N3210	NPN SAT SWITCH	40	15	5.0	---	---	30	120	10	5.0	0.5	100	4.0	400	---	15	20
2N3241A	NPN AMPL/SWITCH	30	25	7.5	100	25	100	200	10	10	0.25	200	20	50	10	---	---
2N3242A	NPN AMPL/SWITCH	40	40	8.0	10	25	125	300	10	10	0.3	300	20	50	6.0	---	---
2N3246	NPN LOW NOISE	60	40	10	.100	40	400	---	1.0	5.0	0.5	5.0	5.0	60	2.0	---	---
2N3248	PNP SAT SWITCH	15	12	5.0	0.05	10	50	150	10	1.0	0.125	10	8.0	250	---	15	20
2N3249	PNP SAT SWITCH	15	12	5.0	0.05	10	100	300	10	1.0	0.25	10	8.0	300	---	15	20
2N3250A	PNP AMPL/SWITCH	60	60	5.0	0.02	40	50	150	10	1.0	0.25	10	6.0	250	---	35	50
2N3251A	PNP AMPL/SWITCH	60	60	5.0	0.02	40	100	300	10	1.0	0.25	10	6.0	300	---	35	50
2N3301	NPN AMPL/SWITCH	60	30	5.0	0.01	50	40	120	150	10	0.22	150	8.0	250	---	---	---
2N3302	NPN AMPL/SWITCH	60	30	5.0	0.01	50	100	300	150	10	0.22	150	8.0	250	---	---	---
2N3496	PNP AMPL/SWITCH	80	80	4.0	0.1	50	40	---	10	10	0.3	10	7.0	200	---	---	---
2N3497	PNP AMPL/SWITCH	120	120	4.0	0.1	90	40	---	10	10	0.35	10	6.0	150	---	---	---
2N3504	PNP AMPL/SWITCH	45	45	5.0	---	---	100	300	150	10	0.25	50	8.0	200	---	---	---
2N3505	PNP AMPL/SWITCH	60	60	5.0	0.01	30	100	300	150	10	0.4	150	8.0	200	---	---	---
2N3545	PNP SAT SWITCH	20	20	5.0	---	---	40	120	10	1.0	0.5	100	8.0	250	---	60	90
2N3546	PNP SAT SWITCH	15	12	4.5	0.01	10	30	120	10	1.0	0.5	100	6.0	700	---	40	30
2N3547	PNP LOW NOISE	60	60	6.0	0.025	45	100	500	1.0	5.0	1.0	10	8.0	45	5.0	---	---
2N3548	PNP LOW NOISE	60	45	6.0	0.01	45	100	300	0.01	5.0	1.0	10	8.0	60	4.0	---	---
2N3549	PNP LOW NOISE	60	60	6.0	0.01	45	100	500	0.01	5.0	1.0	10	8.0	60	4.0	---	---
2N3550	PNP LOW NOISE	60	45	8.0	0.01	45	200	600	0.01	5.0	0.5	5.0	8.0	60	4.0	---	---

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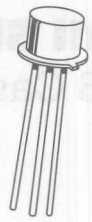
TO-18 Case (Continued)



TYPE NO.	DESCRIPTION	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (μA) MAX *I_{CES} **I_{CEV}	(V_{CBO})	hFE MIN	hFE MAX	@ I_C (mA)	@ V_{CE} (V_{CE})	$V_{CE(SAT)}$ (V) MAX	@ I_C (mA)	C_{ob} (pF) MAX	f_T (MHZ) MIN	NF (dB) MAX	t_{on} (ns) MAX	t_{off} (ns) MAX
2N3576	PNP SAT SWITCH	20	15	5.0	---	---	40	120	10	1.0	0.5	100	4.5	400	---	30	50
2N3672	PNP AMPL/SWITCH	60	50	5.0	0.01	30	75	275	150	10	0.4	150	9.0	200	---	---	---
2N3700	NPN AMPL/SWITCH	140	80	7.0	0.01	90	100	300	150	10	0.2	150	12	100	---	---	---
2N3701	NPN AMPL/SWITCH	140	80	7.0	0.01	90	40	120	150	10	0.2	150	12	80	---	---	---
2N3798A	PNP LOW NOISE	90	90	5.0	0.01	50	150	450	0.5	5.0	0.25	1.0	4.0	30	3.5	---	---
2N3799A	PNP LOW NOISE	90	90	5.0	0.01	50	300	900	0.5	5.0	0.25	1.0	4.0	30	2.5	---	---
2N3829	PNP AMPL/SWITCH	35	20	5.0	0.3*	20	30	120	30	0.4	0.18	30	6.0	350	---	35	65
2N3946	NPN AMPL/SWITCH	60	40	6.0	0.01	40	20	---	50	1.0	0.3	50	4.0	250	---	---	---
2N3947	NPN AMPL/SWITCH	60	40	6.0	0.01	40	40	---	50	1.0	0.3	50	4.0	300	---	---	---
2N3962	PNP LOW NOISE	60	60	6.0	0.01	50	100	450	1.0	5.0	0.25	10	6.0	40	3.0	---	---
2N3963	PNP LOW NOISE	80	80	6.0	0.01	70	100	450	1.0	5.0	0.25	10	6.0	40	3.0	---	---
2N3964	PNP LOW NOISE	45	45	6.0	0.01	40	250	600	1.0	5.0	0.25	10	6.0	40	2.0	---	---
2N3965	PNP LOW NOISE	60	60	6.0	0.01	50	250	600	1.0	5.0	0.25	10	6.0	40	2.0	---	---
2N4013	NPN HIGH CURRENT SWITCH	50	30	6.0	1.7	40	60	150	100	1.0	0.42	500	12	300	---	35	60
2N4014	NPN HIGH CURRENT SWITCH	80	50	6.0	1.7	60	60	150	100	1.0	0.52	500	10	300	---	35	60
2N4026	PNP AMPL/SWITCH	70	60	5.0	---	---	40	200	100	5.0	0.15	150	20	100	---	---	---
2N4027	PNP AMPL/SWITCH	80	80	5.0	0.05	60	40	200	100	5.0	0.5	500	20	150	---	---	---
2N4028	PNP AMPL/SWITCH	60	60	5.0	0.05	50	100	300	100	5.0	0.5	500	20	100	---	---	---
2N4029	PNP AMPL/SWITCH	80	80	5.0	0.05	60	100	300	100	5.0	0.5	500	20	150	---	---	---
2N4034	PNP SAT SWITCH	40	40	5.0	0.015	30	70	200	10	1.0	0.3	50	2.2	400	---	40	150
2N4035	PNP SAT SWITCH	40	40	5.0	0.015	30	150	300	10	1.0	0.3	50	2.2	450	---	40	150
2N4068	NPN AMPL/SWITCH	150	150	5.0	50	120	30	---	30	10	3.0	30	3.5	50	---	---	---
2N4137	NPN SAT SWITCH	40	15	4.0	---	---	40	---	10	1.0	0.35	10	4.0	500	---	---	---
2N4207	PNP ULTRA HIGH SPEED SWITCH	6.0	6.0	4.0	0.01	3.0	50	120	10	0.03	0.15	10	3.0	650	---	---	15
2N4208	PNP SAT SWITCH	12	12	4.0	0.01	6.0	30	120	10	0.3	0.15	10	3.0	700	---	---	20
2N4209	PNP SAT SWITCH	15	15	4.0	0.01	8.0	50	120	10	0.3	0.18	10	3.0	850	---	---	20
2N4269	NPN AMPL/SWITCH	200	140	15	1.0	150	40	200	10	10	1.0	10	5.0	---	---	---	---
2N4359	PNP LOW NOISE	60	45	5.0	---	---	50	500	0.01	5.0	---	---	---	---	5.0	---	---
2N4384	NPN LOW NOISE	40	30	5.0	0.01	30	100	500	0.01	5.0	0.2	10	8.0	---	2.0	---	---
2N4386	NPN LOW NOISE	40	30	5.0	0.01	30	40	500	0.01	5.0	0.2	10	8.0	---	3.0	---	---
2N4390	NPN AMPL/SWITCH	120	120	6.0	1.0**	70	20	---	2.0	1.0	0.2	2.0	6.0	50	---	---	---
2N4413A	PNP LOW NOISE	60	60	5.0	0.01	30	100	500	0.01	5.0	0.2	10	8.0	---	2.0	---	---
2N4415A	PNP LOW NOISE	60	60	5.0	0.01	30	40	500	0.01	5.0	0.2	10	8.0	---	2.0	---	---
2N4962	NPN AMPL/SWITCH	60	60	6.0	0.01	50	100	300	150	10	0.5	500	15	250	---	---	---
2N4963	NPN AMPL/SWITCH	80	80	6.0	0.01	50	100	300	150	10	0.5	500	15	250	---	---	---
2N5056	PNP FAST SWITCH	15	15	4.5	50*	10	30	100	30	0.5	0.19	30	4.5	600	---	---	35
2N5057	PNP FAST SWITCH	15	15	4.5	50*	10	40	100	30	0.5	0.19	30	4.5	800	---	---	35

Small Signal Transistors

TO-18 Case (Continued)

TYPE NO.	DESCRIPTION	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (μA) MAX *I_{CES} **I_{CEV}	(V)	h_{FE} MIN	h_{FE} MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ @ I_C (V) MAX	(mA)	C_{ob} (pF) MAX	f_T (MHZ) MIN	NF (dB) MAX	t_{on} (ns) MAX	t_{off} (ns) MAX
2N5183	NPN AMPL/SWITCH	18	18	7.0	0.5	12	75	400	10	10	0.5	300	20	125	---	---	---
2N6430	NPN HIGH VOLTAGE	200	200	6.0	0.1	160	50	200	30	10	0.5	20	4.0	50	---	---	---
2N6431	NPN HIGH VOLTAGE	300	300	6.0	0.1	200	50	200	30	10	0.5	20	4.0	50	---	---	---
2N6432	PNP HIGH VOLTAGE	200	200	5.0	0.25	160	30	150	30	10	0.5	20	6.0	50	---	---	---
2N6433	PNP HIGH VOLTAGE	300	300	5.0	0.25	200	30	150	30	10	0.5	20	6.0	50	---	---	---
BC110	NPN AMPL/SWITCH	80	80	8.0	0.1	80	30	---	2.0	5.0	0.6	50	5.0	50	---	---	---
BC187	PNP AMPL/SWITCH	30	25	5.0	0.1	30	140	---	2.0	5.0	---	---	---	---	---	---	---
BC393	PNP AMPL/SWITCH	180	180	6.0	0.05	100	50	100	10	10	0.3	10	7.0	5.0	---	100	400
BC394	NPN AMPL/SWITCH	180	180	6.0	0.05	100	50	100	10	10	0.3	10	7.0	5.0	---	100	400
BC477	PNP AMPL/SWITCH	90	80	6.0	0.01*	70	70	250	2.0	5.0	0.25	10	6.0	150	10	---	---
BCX22	NPN AMPL/SWITCH	125	125	5.0	0.1*	100	40	---	200	1.0	0.9	300	12	50	---	---	---
BCX23	PNP AMPL/SWITCH	125	125	5.0	0.1*	100	40	---	200	1.0	0.9	300	12	50	---	---	---
BCX24	NPN AMPL/SWITCH	100	100	7.0	0.03*	0.03*	20	---	10	1.0	0.9	300	12	30	---	---	---
BCX39	PNP AMPL/SWITCH	100	100	5.0	0.1*	100	40	---	200	1.0	0.9	300	12	50	---	---	---
BCX94	NPN AMPL/SWITCH	100	100	5.0	100*	100	63	---	100	1.0	0.9	300	8.0	50	---	---	---
BCY70	PNP AMPL/SWITCH	50	40	5.0	0.5	50	15	---	50	1.0	0.25	10	6.0	250	6.0	65	420
BCY71	PNP AMPL/SWITCH	45	45	5.0	0.5	45	100	600	10	1.0	0.25	10	6.0	250	2.0	---	---
BCY79	PNP AMPL/SWITCH	45	45	5.0	0.1*	45	80	1,000	10	1.0	0.25	10	7.0	180	6.0	150	800
BFR16	NPN LOW NOISE	60	60	8.0	0.01*	50	150	490	1.0	5.0	5.0	10	6.0	70	4.0	---	---
BFW68	NPN AMPL/SWITCH	50	40	5.0	0.01	30	45	---	1.0	10	0.15	10	4.0	250	6.0	30	240
BFX65	PNP AMPL/SWITCH	45	45	6.0	0.01*	40	100	---	1.0	5.0	0.25	10	6.5	100	3.0	---	---
BFY18	NPN AMPL/SWITCH	40	25	3.0	0.01	20	25	---	10	9.0	1.5	10	5.5	200	---	---	---
BFY74	NPN AMPL/SWITCH	60	45	5.0	0.01	45	40	180	10	5.0	1.0	10	4.0	250	---	---	---
BFY76	NPN LOW NOISE	60	60	8.0	0.02*	50	150	300	1.0	5.0	0.35	1.0	6.0	70	4.0	---	---
BSV68	PNP AMPL/SWITCH	110	100	6.0	10	110	30	---	10	5.0	0.25	25	5.0	50	---	---	---
BSX19	NPN AMPL/SWITCH	40	15	---	0.4	20	20	60	10	1.0	0.25	10	4.0	400	---	12	15
BSX20	NPN AMPL/SWITCH	40	15	4.5	0.4	20	40	120	10	1.0	0.25	10	4.0	500	---	12	18
BSX21	NPN AMPL/SWITCH	120	80	5.0	0.2	90	20	---	4.0	1.0	0.70	4.0	4.5	60	---	---	---
BSX36	PNP AMPL/SWITCH	40	40	5.0	0.015	25	40	---	10	10	1.8	500	8.0	100	---	40	100
BSX49	NPN AMPL/SWITCH	60	40	5.0	0.07	50	25	---	100	1.0	1.0	500	6.0	250	---	50	95
BSX79	NPN AMPL/SWITCH	50	45	5.0	0.01	25	100	750	10	1.0	0.2	10	5.0	200	---	150	800
BSY18	NPN AMPL/SWITCH	20	12	5.0	1.0	20	40	120	10	0.35	0.28	10	5.0	280	---	16	24
BSY62	NPN AMPL/SWITCH	25	15	5.0	0.5	15	20	300	10	1.0	0.6	10	5.0	280	---	40	75
BSY79	NPN AMPL/SWITCH	120	---	5.0	0.05	90	30	---	1.0	1.0	0.5	2.0	4.0	50	---	---	---
BSY95A	NPN AMPL/SWITCH	20	15	5.0	0.05	16	50	200	10	0.35	0.35	10	6.0	200	---	---	---
MM4257	PNP FAST SWITCH	6.0	6.0	4.5	0.01*	6.0	30	120	10	0.3	0.15	10	3.0	500	---	25	25
MM4258	PNP FAST SWITCH	12	12	4.5	0.01*	6.0	30	120	10	0.3	0.15	10	3.0	700	---	25	30

Small Signal Transistors

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TYPE NO.	DESCRIPTION	V_{CBO} (V)	V_{CEO} (V) *V_{CER}	V_{EBO} (V)	I_{CBO} @ V_{CBO} (μA) *I_{CEO} **I_{CES} ***I_{CEV} ****I_{CER}	(V)	h_{FE}		@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ @ I_C (V)	(mA)	f_T (MHz) *TYP	C_{ob} (pF) *TYP	t_{on} (ns) *TYP	t_{off} (ns) *TYP	NF (dB) *TYP
		MIN	MIN	MIN			MIN	MAX			MAX		MIN	MAX	MAX	MAX	MAX
2N656A	NPN AMPL/SWITCH	60	60	6.0	10	30	30	90	200	10	2.00	200	50	20	---	---	---
2N657A	NPN AMPL/SWITCH	100	100	6.0	10	30	30	90	200	10	2.00	200	50	20	---	---	---
2N696	NPN AMPL/SWITCH	60	40	5.0	1.00	30	20	60	150	10	1.50	150	80	35	---	---	---
2N697A	NPN AMPL/SWITCH	60	35	5.0	1.00	30	40	120	150	10	1.50	150	50	35	---	---	---
2N698	NPN AMPL/SWITCH	120	60	7.0	0.05	75	20	60	150	10	1.50	150	50	15	---	---	---
2N699B	NPN AMPL/SWITCH	120	80	7.0	0.01	90	40	120	150	10	1.30	150	60	15	---	---	---
2N1052	NPN HIGH VOLTAGE	200	155	6.0	10	200	20	80	200	6.0	5.00	200	8.0	50	---	---	---
2N1053	NPN AMPL/SWITCH	180	135	6.0	10	180	20	80	200	6.0	5.00	200	8.0	50	---	---	---
2N1054	NPN AMPL/SWITCH	125	115	6.0	5.00	125	20	---	200	6.0	4.00	200	8.0	50	---	---	---
2N1055	NPN AMPL/SWITCH	100	100	6.0	15	100	20	80	50	6.0	2.00	50	3.0	---	---	---	---
2N1116	NPN AMPL/SWITCH	60	60	6.0	15	60	40	150	500	6.0	5.00	500	6.0	80	---	---	---
2N1117	NPN AMPL/SWITCH	60	60	6.0	15	60	40	150	200	6.0	4.00	200	4.0	---	---	---	---
2N1118	PNP AMPL/SWITCH	25	25	6.0	1.00	25	15	---	1.0	6.0	---	---	---	12	---	---	---
2N1119	PNP AMPL/SWITCH	10	10	6.0	0.10	10	15	---	15	0.5	0.15	5.0	---	12	---	---	---
2N1131A	PNP AMPL/SWITCH	60	40	5.0	0.50	45	20	45	150	10	1.50	150	90	45	---	---	---
2N1132B	PNP AMPL/SWITCH	70	50	6.0	0.10	50	30	75	150	10	1.50	150	90	30	---	---	---
2N1258	PNP AMPL/SWITCH	30	30	5.0	0.20	20	75	150	10	1.0	0.60	10	---	10	---	---	---
2N1259	PNP AMPL/SWITCH	50	50	5.0	0.20	30	25	100	10	1.0	0.30	10	---	10	---	---	---
2N1420	NPN AMPL/SWITCH	60	30	5.0	1.00	30	100	300	150	10	1.50	150	50	35	---	---	---
2N1445	NPN AMPL/SWITCH	120	120	6.0	10	120	20	80	200	10	4.00	200	---	---	---	---	---
2N1479	NPN AMPL/SWITCH	60	40	6.0	10	30	20	60	200	4.0	1.40	200	1.5	---	---	---	---
2N1480	NPN AMPL/SWITCH	100	55	6.0	10	30	20	60	200	4.0	1.40	200	1.5	---	---	---	---
2N1481	NPN AMPL/SWITCH	60	40	6.0	10	30	35	100	200	4.0	1.40	200	1.5	---	---	---	---
2N1482	NPN AMPL/SWITCH	100	55	6.0	10	30	35	100	200	4.0	1.40	200	1.5	---	---	---	---
2N1507	NPN AMPL/SWITCH	60	25	5.0	1.00	30	100	300	150	10	1.50	150	50	35	---	---	---
2N1573	NPN AMPL/SWITCH	125	80	5.0	1.00	40	30	100	5.0	5.0	1.00	10	60	10	---	---	---
2N1574	NPN AMPL/SWITCH	125	80	5.0	1.00	40	60	200	5.0	5.0	1.00	10	60	10	---	---	---
2N1613B	NPN AMPL/SWITCH	120	50	7.0	0.10	60	40	120	150	10	0.20	150	60	10	---	---	---
2N1615	NPN AMPL/SWITCH	100	100	6.0	2.00	60	25	---	5.0	10	5.00	50	5.0	20	---	---	---
2N1676	PNP AMPL/SWITCH	4.5	4.5	4.5	0.10	4.5	25	---	2.0	0.2	1.50	10	40	7.0	---	---	---
2N1700	NPN AMPL/SWITCH	60	40	6.0	75	40	20	80	100	4.0	1.00	100	---	---	---	---	---
2N1711	NPN AMPL/SWITCH	75	50	7.0	0.10	60	100	300	150	10	1.00	150	70	25	---	---	---
2N1711B	NPN AMPL/SWITCH	120	50	7.0	0.10	60	100	300	150	10	0.20	150	70	10	---	---	---
2N1716	NPN AMPL/SWITCH	60	60	6.0	2.00	60	40	120	200	5.0	2.00	200	16	50	---	---	---
2N1717	NPN AMPL/SWITCH	100	100	6.0	1.00	75	40	120	200	5.0	2.00	200	16	50	---	---	---
2N1889	NPN AMPL/SWITCH	100	60	7.0	0.10	75	40	120	150	10	5.00	150	50	15	---	---	---
2N1890	NPN AMPL/SWITCH	100	60	7.0	0.10	75	100	300	150	10	1.20	50	60	15	---	---	---
2N1893A	NPN AMPL/SWITCH	140	80	7.0	0.10	90	40	120	150	10	2.00	150	100	8.0	---	---	---
2N1973	NPN AMPL/SWITCH	100	60	7.0	0.025	75	75	---	10	10	1.20	50	60	15	---	---	---
2N1974	NPN AMPL/SWITCH	100	60	7.0	0.025	75	35	---	10	10	1.20	50	50	15	---	---	---

Small Signal Transistors

TO-39 Case (Continued)

TYPE NO.	DESCRIPTION	V_{CBO} (V) *V_{CER} MIN	V_{CEO} (V) MIN	V_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (μA) *I_{CEO} **I_{CES} ***I_{CEV} ****I_{CER}	(V)	h_{FE} MIN	h_{FE} MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ MAX (V)	@ I_C (mA)	f_T (MHz) *TYP MIN	C_{ob} (pF) *TYP MAX	t_{on} (ns) *TYP MAX	t_{off} (ns) *TYP MAX	NF (dB) *TYP MAX
2N1975	NPN AMPL/SWITCH	100	60	7.0	0.025	75	15	---	10	10	1.20	50	40	15	---	---	---
2N1983	NPN AMPL/SWITCH	50	25	5.0	5.00	30	70	240	5.0	5.0	0.25	5.0	40	45	---	---	---
2N1984	NPN AMPL/SWITCH	50	25	5.0	5.00	30	35	120	5.0	5.0	0.25	5.0	40	45	---	---	---
2N1985	NPN AMPL/SWITCH	50	25	5.0	5.00	30	15	80	5.0	5.0	0.25	5.0	40	45	---	---	---
2N1986	NPN AMPL/SWITCH	50	25	5.0	5.00	30	60	240	150	10	1.50	150	40	35	---	---	---
2N1987	NPN AMPL/SWITCH	50	25	5.0	5.00	30	20	80	150	10	1.50	150	40	35	---	---	---
2N1988	NPN AMPL/SWITCH	100	45	5.0	5.00	50	35	120	30	10	2.00	30	40	20	---	---	---
2N1989	NPN AMPL/SWITCH	100	45	5.0	5.00	50	20	60	30	10	2.00	30	40	20	---	---	---
2N1990	NPN AMPL/SWITCH	100	60	3.0	10	75	20	---	30	10	0.50	2.0	40	20	---	---	---
2N2017	NPN AMPL/SWITCH	60	60	6.0	10	30	50	200	200	10	2.00	200	---	---	---	---	---
2N2049	NPN AMPL/SWITCH	75	40	7.0	0.10	60	100	300	150	10	0.40	10	50	25	---	---	---
2N2102A	NPN AMPL/SWITCH	120	65	7.0	0.002	60	40	120	150	10	0.30	150	60	15	---	---	---
2N2107	NPN AMPL/SWITCH	60	60	6.0	10	30	30	90	200	10	2.00	200	---	---	---	---	---
2N2175	PNP AMPL/SWITCH	6.0	6.0	6.0	1.00	6.0	30	---	0.02	1.5	---	---	3.0	---	---	---	---
2N2177	PNP AMPL/SWITCH	6.0	6.0	6.0	0.50	6.0	35	---	0.05	4.5	---	---	8.0	---	---	---	---
2N2192B	NPN AMPL/SWITCH	60	40	5.0	0.10	30	100	300	150	10	0.18	150	50	20	---	---	---
2N2193B	NPN AMPL/SWITCH	80	50	6.0	0.10	60	40	120	150	10	0.18	150	50	20	---	---	---
2N2195B	NPN AMPL/SWITCH	45	25	5.0	0.10	30	20	---	150	10	0.18	150	50	20	---	---	---
2N2218A	NPN AMPL/SWITCH	75	40	6.0	0.10	60	40	120	150	10	0.30	150	250	8.0	---	---	---
2N2219A	NPN AMPL/SWITCH	75	40	6.0	0.10	60	100	300	150	10	0.30	150	250	8.0	---	---	---
2N2237	NPN AMPL/SWITCH	40	20	6.0	---	---	40	125	100	10	0.25	100	50	35	---	---	---
2N2243A	NPN AMPL/SWITCH	120	80	7.0	10	60	40	120	150	10	0.25	150	50	15	---	---	---
2N2270	NPN AMPL/SWITCH	60	45	7.0	0.50	60	50	200	150	10	0.90	150	100	15	---	---	---
2N2297	NPN AMPL/SWITCH	80	35	7.0	0.10	60	40	120	150	10	0.20	150	60	12	---	---	---
2N2303	PNP AMPL/SWITCH	50	35	5.0	1.00	30	75	200	150	10	1.50	150	60	45	---	---	---
2N2309	NPN AMPL/SWITCH	30	30	5.0	---	---	25	125	0.2	5.0	---	---	40	25	---	---	---
2N2380A	NPN AMPL/SWITCH	80	40	5.0	---	---	20	120	150	10	1.30	150	100	14	---	---	---
2N2405	NPN AMPL/SWITCH	120	90	7.0	0.10	90	60	200	150	10	0.50	150	50	15	---	---	---
2N2410	NPN CORE DRIVER	60	30	5.0	0.30	30	30	120	150	10	0.45	150	200	11	65	65	---
2N2476	NPN CORE DRIVER	60	20	5.0	0.20	50	20	---	150	10	0.40	150	250	10	25	45	---
2N2477	NPN CORE DRIVER	60	20	5.0	0.20	50	40	---	150	10	0.40	150	250	10	25	45	---
2N2479	NPN AMPL/SWITCH	80	40	5.0	---	---	30	120	150	10	0.85	150	150	14	---	---	---
2N2481	NPN SAT SWITCH	40	15	5.0	0.50	20	40	120	10	1.0	0.25	10	300	5.0	40	55	---
2N2594	NPN AMPL/SWITCH	80	80	7.0	0.10	60	50	150	100	5.0	1.00	200	40	20	---	---	---
2N2657	NPN AMPL/SWITCH	80	60	7.0	0.10	60	40	120	1,000	2.0	0.50	1,000	20	150	---	---	---
2N2658	NPN AMPL/SWITCH	100	80	7.0	0.10	60	40	120	1,000	2.0	0.50	1,000	20	150	---	---	---
2N2726	NPN HIGH VOLTAGE	200	150	6.0	1.00	100	30	90	200	10	2.00	200	5.0	---	---	---	---
2N2727	NPN HIGH VOLTAGE	200	150	6.0	1.00	100	75	150	200	10	2.00	200	10	---	---	---	---
2N2800	PNP AMPL/SWITCH	50	35	5.0	0.10	30	30	---	150	10	1.00	150	120	25	---	---	---
2N2801	PNP AMPL/SWITCH	50	35	5.0	0.10	30	75	---	150	10	1.00	150	120	25	---	---	---

Small Signal Transistors

TO-39 Case (Continued)

TYPE NO.	DESCRIPTION	V_{CBO} (V)	V_{CEO} (V) *V_{CER}	V_{EBO} (V)	I_{CBO} @ V_{CBO} (μA) *I_{CEO} **I_{CES} ***I_{CEV} ****I_{CER}	(V)	h_{FE}		@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ @ I_C (V)	(mA)	f_T (MHz) *TYP	C_{ob} (pF) *TYP	t_{on} (ns) *TYP	t_{off} (ns) *TYP	NF (dB) *TYP
		MIN	MIN	MIN			MIN	MAX			MAX		MIN	MAX	MAX	MAX	MAX
2N2854	NPN AMPL/SWITCH	60	40	5.0	0.10	40	100	300	1,000	1.0	0.40	1,000	---	---	---	---	---
2N2855	NPN AMPL/SWITCH	60	40	5.0	0.10	40	40	120	1,000	1.0	0.40	1,000	---	---	---	---	---
2N2890	NPN AMPL/SWITCH	100	80	5.0	0.50	60	30	90	1,000	2.0	0.50	1,000	30	70	---	---	---
2N2891	NPN AMPL/SWITCH	100	80	5.0	0.50	60	50	150	1,000	2.0	0.50	1,000	30	70	---	---	---
2N2904A	PNP AMPL/SWITCH	60	60	5.0	0.10	50	40	120	150	10	0.40	150	200	8.0	---	---	---
2N2905A	PNP AMPL/SWITCH	60	60	5.0	0.10	50	100	300	150	10	0.40	150	200	8.0	---	---	---
2N2927	PNP AMPL/SWITCH	30	25	4.0	---	---	30	130	50	5.0	0.25	50	100	20	---	---	---
2N2951	NPN AMPL/SWITCH	60	20	5.0	0.10	50	20	150	10	10	0.50	150	200	8.0	---	---	---
2N2958	NPN AMPL/SWITCH	60	20	5.0	0.025	50	40	120	150	10	0.50	150	250	8.0	---	---	---
2N2959	NPN AMPL/SWITCH	60	20	5.0	0.025	50	100	300	150	10	0.50	150	250	8.0	---	---	---
2N2960	NPN AMPL/SWITCH	60	30	5.0	---	---	100	300	150	10	0.50	150	250	8.0	---	---	---
2N2961	NPN AMPL/SWITCH	60	30	5.0	---	---	100	300	150	10	2.00	500	250	8.0	---	---	---
2N3015	NPN CORE DRIVER	60	30	5.0	0.20	30	30	120	150	10	0.40	150	250	8.0	---	60	---
2N3019	NPN AMPL/SWITCH	140	80	7.0	0.10	90	100	300	150	10	0.20	150	100	12	---	---	---
2N3020	NPN AMPL/SWITCH	140	80	7.0	0.10	90	40	120	150	10	0.20	150	100	12	---	---	---
2N3053	NPN AMPL/SWITCH	60	40	5.0	0.25	30	50	250	150	10	1.40	150	100	15	---	---	---
2N3072	PNP AMPL/SWITCH	60	60	4.0	0.01**	30	30	130	50	1.0	1.00	300	130	10	---	---	---
2N3107	NPN AMPL/SWITCH	100	60	7.0	0.01**	60	100	300	150	10	1.00	1,000	70	20	---	---	---
2N3108	NPN AMPL/SWITCH	100	60	7.0	0.01*	60	40	120	150	10	1.00	1,000	60	20	---	---	---
2N3109	NPN AMPL/SWITCH	80	40	7.0	0.01*	60	100	300	150	10	0.25	150	70	25	---	---	---
2N3110	NPN AMPL/SWITCH	80	40	7.0	0.01*	60	40	120	150	10	0.25	150	60	25	---	---	---
2N3114	NPN HIGH VOLTAGE	150	150	5.0	10	100	30	120	30	10	1.00	50	40	9.0	---	---	---
2N3119	NPN AMPL/SWITCH	100	80	4.0	50	60	50	200	100	10	0.50	100	250	6.0	40	700	---
2N3120	PNP AMPL/SWITCH	45	45	4.0	0.01*	30	30	130	150	1.0	0.50	300	130	10	---	---	---
2N3122	NPN AMPL/SWITCH	50	30	5.0	---	---	25	100	300	10	1.50	300	60	25	---	---	---
2N3133	PNP AMPL/SWITCH	50	35	4.0	0.50	30	40	120	150	10	0.60	150	200	10	---	---	---
2N3134	PNP AMPL/SWITCH	50	35	4.0	0.50	30	100	300	150	10	0.60	150	200	10	---	---	---
2N3137	NPN VHF/UHF OSC	40	20	4.0	0.50	20	20	120	50	5.0	0.30	50	500	3.5	---	---	---
2N3244	PNP CORE DRIVER	40	40	5.0	0.50	30	50	150	500	1.0	1.00	1,000	175	25	50	185	---
2N3245	PNP CORE DRIVER	50	50	5.0	0.50	30	30	90	500	1.0	1.20	1,000	150	25	55	165	---
2N3252	NPN CORE DRIVER	60	30	5.0	0.50	40	30	90	500	1.0	1.00	1,000	200	12	45	70	---
2N3253	NPN CORE DRIVER	75	40	5.0	0.50	60	25	75	500	1.0	1.20	1,000	175	12	50	70	---
2N3299	NPN AMPL/SWITCH	60	30	5.0	0.01**	50	40	120	150	10	0.60	500	250	8.0	60	150	---
2N3300	NPN AMPL/SWITCH	60	30	5.0	0.01**	50	100	300	150	10	0.60	500	250	8.0	60	150	---
2N3326	NPN AMPL/SWITCH	60	40	5.0	0.10	50	40	120	150	10	0.40	150	250	8.0	---	---	---
2N3388	NPN AMPL/SWITCH	125	100	6.0	---	---	60	---	2.5	5.0	1.00	2.5	36	35	---	---	---
2N3420	NPN AMPL/SWITCH	85	60	6.0	0.50***	80	40	120	1,000	2.0	0.50	2,000	40	150	---	---	---
2N3421	NPN AMPL/SWITCH	125	80	6.0	0.50***	120	40	120	1,000	2.0	0.50	2,000	40	150	---	---	---
2N3439	NPN HIGH VOLTAGE	450	350	7.0	20	360	40	160	20	10	0.50	50	15	10	---	---	---
2N3440	NPN HIGH VOLTAGE	300	250	7.0	20	250	40	160	20	10	0.50	50	15	10	---	---	---

Small Signal Transistors

TO-39 Case (Continued)

TYPE NO.	DESCRIPTION	V_{CBO} (V) MIN	V_{CEO} (V) *V_{CER} MIN	V_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (μA) *I_{CEO} **I_{CES} ***I_{CEV} ****I_{CER}	(V)	h_{FE} MIN	h_{FE} MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V) MAX	@ I_C (mA)	f_T (MHz) *TYP MIN	C_{ob} (pF) *TYP MAX	t_{on} (ns) *TYP MAX	t_{off} (ns) *TYP MAX	NF (dB) *TYP MAX
2N3444	NPN CORE DRIVER	80	50	5.0	0.50	60	20	60	500	1.0	1.20	1,000	150	12	50	70	---
2N3467	PNP CORE DRIVER	40	40	5.0	0.10	30	40	120	500	1.0	0.30	150	175	25	40	90	---
2N3468	PNP CORE DRIVER	50	50	5.0	0.10	30	25	75	500	1.0	0.35	150	150	25	40	90	---
2N3494	PNP AMPL/SWITCH	80	80	4.5	0.10	50	40	---	10	10	0.30	10	200	7.0	---	---	---
2N3495	PNP AMPL/SWITCH	120	120	4.0	0.10	90	40	---	10	10	0.35	10	150	6.0	---	---	---
2N3498	NPN AMPL/SWITCH	100	100	6.0	0.05	50	40	120	150	10	0.60	300	150	10	---	---	---
2N3499	NPN AMPL/SWITCH	100	100	6.0	0.05	50	100	300	150	10	0.60	300	150	10	---	---	---
2N3500	NPN HIGH VOLTAGE	150	150	6.0	0.05	75	40	120	150	10	0.40	150	150	8.0	---	---	---
2N3501	NPN HIGH VOLTAGE	150	150	6.0	0.05	75	100	300	150	10	0.40	150	150	8.0	---	---	---
2N3502	PNP AMPL/SWITCH	45	45	5.0	0.01**	30	100	300	150	10	0.40	150	200	8.0	---	---	---
2N3503	PNP AMPL/SWITCH	60	60	5.0	0.01**	50	100	300	150	10	0.40	150	200	8.0	---	---	---
2N3554	NPN CORE DRIVER	60	30	5.0	---	---	25	100	750	10	0.70	750	150	25	50	105	---
2N3634	PNP AMPL/SWITCH	140	140	5.0	0.10	100	50	150	50	10	0.60	50	150	10	---	---	---
2N3660	PNP AMPL/SWITCH	40	30	5.0	1.20	500	25	100	500	10	1.20	500	30	275	---	---	---
2N3661	PNP AMPL/SWITCH	60	50	5.0	0.10	100	25	100	500	10	1.20	500	30	275	---	---	---
2N3665	NPN AMPL/SWITCH	120	80	6.0	0.50	60	40	120	150	10	0.50	150	60	12	---	---	---
2N3666	NPN AMPL/SWITCH	120	80	6.0	0.50	60	100	300	150	10	0.50	150	60	12	---	---	---
2N3671	PNP AMPL/SWITCH	60	50	5.0	0.10	30	75	275	150	10	0.40	150	200	9.0	---	---	---
2N3678	NPN AMPL/SWITCH	75	55	6.0	0.10	60	40	120	150	10	0.40	150	250	8.0	---	---	---
2N3719	PNP AMPL/SWITCH	40	40	4.0	10	40	25	180	1,000	1.5	0.75	1,000	60	120	---	---	---
2N3720	PNP AMPL/SWITCH	60	60	4.0	10	60	25	180	1,000	1.5	0.75	1,000	60	120	---	---	---
2N3722	NPN CORE DRIVER	60	60	6.0	---	---	40	150	100	5.0	0.22	100	300	10	50	100	---
2N3724A	NPN CORE DRIVER	50	30	6.0	0.50	40	60	150	100	1.0	0.20	100	300	12	35	60	---
2N3725A	NPN CORE DRIVER	80	50	6.0	0.50	60	60	150	100	1.0	0.40	300	300	10	35	60	---
2N3734	NPN CORE DRIVER	50	30	5.0	---	---	30	120	1,000	1.5	0.50	500	300	9.0	48	60	---
2N3735	NPN CORE DRIVER	75	50	5.0	0.20	40	20	80	1,000	1.5	0.50	500	250	9.0	48	60	---
2N3742	NPN HIGH VOLTAGE	300	300	7.0	0.20	200	20	200	30	10	1.00	30	30	6.0	---	---	---
2N3743	PNP HIGH VOLTAGE	300	300	5.0	0.30	200	25	250	30	10	5.00	10	30	15	---	---	---
2N3762	PNP CORE DRIVER	40	40	5.0	---	---	30	100	1,000	10	0.90	1,000	180	15	45	105	---
2N3763	PNP CORE DRIVER	60	60	5.0	---	---	20	80	1,000	10	0.90	1,000	150	15	45	105	---
2N3764	PNP CORE DRIVER	40	40	5.0	---	---	30	120	1,000	10	0.50	500	180	15	45	115	---
2N3830	NPN CORE DRIVER	80	50	5.0	---	---	30	---	500	10	0.50	200	200	12	60	70	---
2N3831	NPN CORE DRIVER	70	40	5.0	---	---	35	---	500	10	0.50	500	200	12	60	70	---
2N3866	NPN VHF/UHF OSC	55	30	3.5	20*	28	10	200	50	5.0	1.00	100	500	3.0	---	---	---
2N3867	PNP AMPL/SWITCH	40	40	4.0	1.00***	40	40	200	1,500	2.0	0.75	1,500	60	120	100	400	---
2N3868	PNP AMPL/SWITCH	60	60	4.0	1.00***	60	30	150	1,500	2.0	0.75	1,500	60	120	100	400	---
2N3923	NPN AMPL/SWITCH	150	150	6.0	0.01	100	30	120	25	10	1.00	25	40	3.5	---	---	---
2N3945	NPN AMPL/SWITCH	70	50	6.0	---	---	40	250	150	10	0.50	150	60	12	---	---	---
2N4000	NPN AMPL/SWITCH	100	80	6.0	2.00**	90	30	120	500	2.0	0.50	1,000	40	60	---	---	---
2N4001	NPN AMPL/SWITCH	120	100	6.0	2.00**	110	40	120	500	2.0	0.50	1,000	40	60	---	---	---

Small Signal Transistors

TO-39 Case (Continued)

TYPE NO.	DESCRIPTION	V_{CBO} (V)	V_{CEO} (V) *V_{CER}	V_{EBO} (V)	I_{CBO} @ V_{CBO} (μA) *I_{CEO} **I_{CES} ***I_{CEV} ****I_{CER}	(V)	h_{FE}		@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V)	@ I_C (mA)	f_T (MHz) *TYP	C_{ob} (pF) *TYP	t_{on} (ns) *TYP	t_{off} (ns) *TYP	NF (dB) *TYP
		MIN	MIN	MIN			MIN	MAX			MAX		MIN	MAX	MAX	MAX	MAX
2N4030	PNP AMPL/SWITCH	60	60	5.0	0.50	50	40	120	100	5.0	0.50	500	100	20	---	---	---
2N4031	PNP AMPL/SWITCH	80	80	5.0	0.50	60	100	300	100	5.0	0.50	500	150	20	---	---	---
2N4032	PNP AMPL/SWITCH	60	60	5.0	0.50	50	40	120	100	5.0	0.50	500	100	20	---	---	---
2N4033	PNP AMPL/SWITCH	80	80	5.0	0.50	60	100	300	100	5.0	0.50	500	150	20	---	---	---
2N4036	PNP AMPL/SWITCH	90	65	7.0	0.20	60	20	200	150	10	0.65	150	60	30	---	---	---
2N4037	PNP AMPL/SWITCH	60	40	7.0	0.25	60	50	250	150	10	1.40	150	60	30	---	---	---
2N4046	NPN CORE DRIVER	50	30	6.0	1.70	40	40	150	100	1.0	0.75	1,000	250	12	35	60	---
2N4047	NPN CORE DRIVER	80	50	6.0	1.70	60	40	150	100	1.0	0.95	1,000	250	10	35	60	---
2N4234	PNP AMPL/SWITCH	40	40	7.0	100	40	30	150	250	1.0	0.60	1,000	3.0	100	---	---	---
2N4235	PNP AMPL/SWITCH	60	60	7.0	100	60	30	150	250	1.0	0.60	1,000	3.0	100	---	---	---
2N4236	PNP AMPL/SWITCH	80	80	7.0	100	80	30	150	250	1.0	0.60	1,000	3.0	100	---	---	---
2N4237	NPN POWER AMPL	50	40	6.0	100	50	30	150	250	1.0	0.60	1,000	2.0	100	---	---	---
2N4238	NPN POWER AMPL	80	60	6.0	100	80	30	150	250	1.0	0.60	1,000	2.0	100	---	---	---
2N4239	NPN POWER AMPL	100	80	6.0	100	100	30	150	250	1.0	0.60	1,000	2.0	100	---	---	---
2N4270	NPN POWER AMPL	200	140	6.0	1.00	150	40	200	10	10	1.00	10	---	5.0	---	---	---
2N4271	NPN AMPL/SWITCH	175	140	6.0	0.50	30	20	140	200	10	0.80	200	20	25	---	---	---
2N4272	NPN AMPL/SWITCH	175	140	6.0	0.10	50	20	140	200	10	0.20	2,000	10	75	---	---	---
2N4300	NPN AMPL/SWITCH	100	80	6.0	10	90	30	120	1.0	2.0	0.30	1.0	30	---	---	---	---
2N4314	PNP AMPL/SWITCH	90	65	7.0	0.25	60	50	250	150	10	1.40	150	60	30	---	---	---
2N4358	PNP HIGH VOLTAGE	240	240	6.0	0.20	200	80	300	10	10	0.50	10	---	---	---	---	---
2N4404	PNP AMPL/SWITCH	80	80	5.0	0.025	60	40	120	150	10	0.50	500	200	10	---	---	---
2N4405	PNP AMPL/SWITCH	80	80	5.0	0.025	60	100	300	150	1.0	0.50	500	200	10	---	---	---
2N4406	PNP AMPL/SWITCH	80	80	5.0	0.025	60	25	100	150	1.0	0.70	1,000	150	15	---	---	---
2N4407	PNP AMPL/SWITCH	80	80	5.0	0.025	60	75	225	150	1.0	0.70	1,000	150	15	---	---	---
2N4427	NPN VHF OSCILLATOR	40	20	3.5	20*	12	10	200	100	5.0	0.50	100	500	4.0	---	---	---
2N4863	NPN AMPL/SWITCH	140	120	6.0	0.10	60	50	150	0.5	5.0	0.20	0.5	50	50	---	---	---
2N4875	NPN AMPL/SWITCH	40	25	---	0.50	15	20	200	50	10	---	---	800	---	---	---	---
2N4876	NPN AMPL/SWITCH	40	30	---	0.50	15	20	200	50	10	---	---	---	---	---	---	---
2N4877	NPN AMPL/SWITCH	70	60	5.0	100	70	20	100	4,000	2.0	1.00	4,000	30	---	---	---	---
2N4890	PNP AMPL/SWITCH	60	40	5.0	0.25***	60	50	250	150	10	1.40	150	100	15	---	---	---
2N4895	NPN AMPL/SWITCH	120	60	6.0	1.00**	60	40	120	2,000	2.0	1.00	5,000	50	80	---	---	---
2N4896	NPN AMPL/SWITCH	120	60	6.0	1.00**	60	100	300	2,000	2.0	1.00	5,000	80	80	---	---	---
2N4897	NPN AMPL/SWITCH	150	80	6.0	1.00**	100	40	120	2,000	2.0	1.00	5,000	50	80	---	---	---
2N4924	NPN AMPL/SWITCH	100	100	5.0	0.10	50	40	200	150	10	0.25	10	100	10	---	---	---
2N4925	NPN HIGH VOLTAGE	150	150	5.0	0.10	75	40	200	150	10	0.25	10	100	10	---	---	---
2N4926	NPN HIGH VOLTAGE	200	200	7.0	0.10	100	20	200	30	10	1.00	10	30	6.0	---	---	---
2N4927	NPN HIGH VOLTAGE	250	250	7.0	0.10	150	20	200	30	10	1.00	10	30	6.0	---	---	---
2N4928	PNP HIGH VOLTAGE	100	100	4.0	0.50	50	25	200	10	10	0.50	10	100	6.0	---	---	---
2N4929	PNP HIGH VOLTAGE	150	150	4.0	0.50	75	25	200	10	10	0.50	10	100	10	---	---	---

Small Signal Transistors

TO-39 Case (Continued)

TYPE NO.	DESCRIPTION	V_{CBO} (V)	V_{CEO} (V) *V_{CER}	V_{EBO} (V)	I_{CBO} @ V_{CBO} (μA) *I_{CEO} **I_{CES} ***I_{CEV} ****I_{CER}	(V)	h_{FE}		@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V)	@ I_C (mA)	f_T (MHz) *TYP	C_{ob} (pF) *TYP	t_{on} (ns) *TYP	t_{off} (ns) *TYP	NF (dB) *TYP
		MIN	MIN	MIN			MIN	MAX			MAX		MIN	MAX	MAX	MAX	MAX
2N4930	PNP HIGH VOLTAGE	200	200	4.0	1.00	150	20	200	10	10	5.00	10	20	20	---	---	---
2N4931	PNP HIGH VOLTAGE	250	250	4.0	1.00	150	20	200	10	10	5.00	10	20	20	---	---	---
2N4943	NPN AMPL/SWITCH	120	80	7.0	0.01	60	100	300	150	10	0.25	150	12	---	---	---	---
2N4960	NPN AMPL/SWITCH	60	60	6.5	0.01	50	100	300	150	10	0.50	500	250	15	---	---	---
2N5022	PNP CORE DRIVER	50	50	5.0	100**	30	25	100	500	1.0	0.80	1.0	170	25	40	90	---
2N5023	PNP CORE DRIVER	30	30	5.0	100**	20	40	100	500	1.0	0.70	1.0	200	25	40	90	---
2N5058	NPN HIGH VOLTAGE	300	300	7.0	0.05	100	35	150	30	25	1.00	30	30	10	---	---	---
2N5059	NPN HIGH VOLTAGE	250	250	6.0	0.05	100	30	150	30	25	1.00	30	30	10	---	---	---
2N5109	NPN HIGH FREQUENCY	40	20	3.0	5.00***	35	40	120	50	15	0.50	100	1,200	3.5	---	---	3.0*
2N5147	PNP HIGH CURRENT	100	80	5.5	1.00**	60	30	90	1,000	5.0	0.85	2,000	---	---	---	---	---
2N5148	NPN HIGH CURRENT	100	80	6.0	1.00**	60	30	90	1,000	5.0	5.00	3,000	60	70	---	---	---
2N5149	PNP HIGH CURRENT	100	80	5.5	1.00**	60	70	200	1,000	5.0	0.85	2,000	60	70	---	---	---
2N5150	NPN HIGH CURRENT	100	80	6.0	1.00**	60	70	200	1,000	5.0	5.00	3,000	60	70	---	---	---
2N5151	PNP HIGH CURRENT	100	80	5.5	1.00**	60	30	90	2,500	5.0	0.75	2,500	60	250	---	---	---
2N5152	NPN HIGH CURRENT	100	80	6.0	1.00**	60	70	200	2,500	5.0	0.75	2,500	70	250	---	---	---
2N5153	PNP HIGH CURRENT	100	80	5.5	1.00**	60	30	90	2,500	5.0	0.75	2,500	60	250	---	---	---
2N5154	NPN HIGH CURRENT	100	80	6.0	1.00**	60	70	200	2,500	5.0	0.75	2,500	70	250	---	---	---
2N5189	NPN CORE DRIVER	60	35	5.0	0.50	30	35	---	500	1.0	1.00	1.0	250	12	40	70	---
2N5262	NPN CORE DRIVER	75	50	5.0	1.00**	30	35	---	100	1.0	0.80	1,000	250	12	30	60	---
2N5320	NPN AMPL/SWITCH	100	75	7.0	100	100	30	130	500	4.0	0.50	500	50	---	80	800	---
2N5321	NPN AMPL/SWITCH	75	50	5.0	100	75	40	250	500	4.0	0.80	500	50	---	80	800	---
2N5322	PNP AMPL/SWITCH	100	75	5.0	100	100	30	130	500	4.0	0.70	500	50	---	100	1,000	---
2N5323	PNP AMPL/SWITCH	75	50	5.0	100	75	40	250	500	4.0	1.20	500	50	---	100	1,000	---
2N5333	PNP AMPL/SWITCH	100	80	6.0	10**	90	30	120	1,000	4.0	1.00	2,000	30	---	---	---	---
2N5334	NPN AMPL/SWITCH	60	60	6.0	5.00	60	30	150	1,000	2.0	0.70	2,000	40	75	---	---	---
2N5335	NPN AMPL/SWITCH	80	80	6.0	5.00	80	30	150	1,000	2.0	0.70	2,000	40	75	---	---	---
2N5336	NPN FAST SWITCH	80	80	6.0	10	80	30	120	2,000	2.0	0.70	2,000	30	250	---	---	---
2N5337	NPN HIGH CURRENT	80	80	6.0	10	80	60	240	2,000	2.0	0.70	2,000	30	250	---	---	---
2N5338	NPN HIGH CURRENT	100	100	6.0	10	100	30	120	2,000	2.0	0.70	2,000	30	250	---	---	---
2N5339	NPN HIGH CURRENT	100	100	6.0	10	100	60	240	2,000	2.0	0.70	2,000	30	250	---	---	---
2N5415	PNP HIGH VOLTAGE	200	200	4.0	50	175	30	150	50	10	2.50	50	15	25	---	---	---
2N5416	PNP HIGH VOLTAGE	350	350	6.0	50	280	30	120	50	10	2.50	50	15	25	---	---	---
2N5679	PNP AMPL/SWITCH	100	100	4.0	1.00	100	40	150	250	2.0	1.00	500	30	50	---	---	---
2N5680	PNP AMPL/SWITCH	120	120	4.0	1.00	120	40	150	250	2.0	1.00	500	30	50	---	---	---
2N5681	NPN AMPL/SWITCH	100	100	4.0	1.00	100	40	150	250	2.0	1.00	500	30	50	---	---	---
2N5682	NPN AMPL/SWITCH	120	120	4.0	1.00	120	40	150	250	2.0	1.00	500	30	50	---	---	---
2N5781	PNP AMPL/SWITCH	80	65	5.0	10***	75	20	100	1,000	2.0	0.50	1,000	8.0	---	---	---	---
2N5782	PNP AMPL/SWITCH	65	50	5.0	10***	60	20	100	1,200	2.0	0.75	1,200	8.0	---	---	---	---
2N5783	PNP AMPL/SWITCH	45	40	3.5	10***	45	20	100	1,600	2.0	1.00	1,600	8.0	---	---	---	---

Small Signal Transistors

TO-39 Case (Continued)

TYPE NO.	DESCRIPTION	V_{CBO} (V)	V_{CEO} (V) *V_{CER}	V_{EBO} (V)	I_{CBO} @ V_{CBO} (μA) *I_{CEO} **I_{CES} ***I_{CEV} ****I_{CER}	(V_{CBO}) (V)	h_{FE}		@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V)	@ I_C (mA)	f_T (MHz) *TYP	C_{ob} (pF) *TYP	t_{on} (ns) *TYP	t_{off} (ns) *TYP	NF (dB) *TYP
		MIN	MIN	MIN			MIN	MAX			MAX		MIN	MAX	MAX	MAX	MAX
2N5784	NPN AMPL/SWITCH	80	65	5.0	10***	75	20	100	1,000	2.0	0.50	1,000	1.0	---	---	---	---
2N5785	NPN AMPL/SWITCH	65	50	5.0	10***	60	20	100	1,200	2.0	0.75	1,200	1.0	---	---	---	---
2N5786	NPN AMPL/SWITCH	45	40	3.5	10***	45	20	100	1,600	2.0	1.00	1,600	1.0		---	---	---
2N5859	NPN CORE DRIVER	80	40	6.0	0.25	50	30	120	500	1.0	0.70	1,000	250	7.0	35	60	---
2N5861	NPN CORE DRIVER	100	50	6.0	0.30	50	25	100	500	1.0	0.50	500	200	7.0	25	60	---
2N6190	PNP HIGH CURRENT	80	80	6.0	10	80	30	120	2,000	2.0	0.70	2,000	30	300	---	---	---
2N6191	PNP HIGH CURRENT	80	80	6.0	10	80	40	240	2,000	2.0	0.70	2,000	30	300	---	---	---
2N6192	PNP HIGH CURRENT	100	100	6.0	10	100	30	120	2,000	2.0	0.70	2,000	30	300	---	---	---
2N6193	PNP HIGH CURRENT	100	100	6.0	10	100	40	240	2,000	2.0	0.70	2,000	30	300	---	---	---
BC140	NPN AMPL/SWITCH	80	40	7.0	0.10**	60	40	250	100	1.0	1.00	1,000	50	25	250	850	---
BC141	NPN AMPL/SWITCH	100	60	7.0	0.10**	60	40	250	100	1.0	1.00	1,000	50	25	250	850	---
BC160	PNP AMPL/SWITCH	40	40	5.0	0.10**	40	40	250	100	1.0	1.00	1,000	50	30	500	650	---
BC161	PNP AMPL/SWITCH	60	60	5.0	0.10**	60	40	250	100	1.0	1.00	1,000	50	30	500	650	---
BC300	NPN AMPL/SWITCH	120	80	7.0	0.02	60	40	240	150	10	0.50	150	100*	12*	---	---	---
BC301	NPN AMPL/SWITCH	90	60	7.0	0.02	60	40	240	150	10	0.50	150	100*	12*	---	---	---
BC302	NPN AMPL/SWITCH	60	45	7.0	0.02	60	40	240	150	10	0.50	150	100*	12*	---	---	---
BC303	PNP AMPL/SWITCH	85	60	6.0	0.02	60	40	240	150	10	0.65	150	100*	15*	---	---	---
BC304	PNP AMPL/SWITCH	60	45	6.0	0.02	60	40	240	150	10	0.65	150	100*	15*	---	---	---
BC440	NPN AMPL/SWITCH	50	40	5.0	0.10	40	40	250	500	4.0	1.00	1,000	50	---	---	---	---
BC441	NPN AMPL/SWITCH	70	60	5.0	0.10	40	40	250	500	4.0	1.00	1,000	50	---	---	---	---
BC460	PNP AMPL/SWITCH	50	40	5.0	0.10	40	40	250	500	4.0	1.00	1,000	50	---	---	---	---
BC461	PNP AMPL/SWITCH	70	60	5.0	0.10	40	40	250	500	4.0	1.00	1,000	50	---	---	---	---
BCW78	NPN AMPL/SWITCH	45	45	5.0	0.02**	45	100	630	100	1.0	0.70	500	---	---	---	---	---
BCW80	PNP AMPL/SWITCH	45	45	5.0	0.02**	45	63	400	100	1.0	0.70	500	---	---	---	---	---
BD115	NPN HIGH VOLTAGE	250	180	5.0	550*	200	22	---	50	100	9.00	100	150*	---	---	---	---
BF178	NPN AMPL/SWITCH	185	115	5.0	0.01	185	20	---	30	20	---	---	120*	---	---	---	---
BF257	NPN HIGH VOLTAGE	160	160	5.0	50	100	25	---	30	10	1.00	30	90*	---	---	---	---
BF258	NPN HIGH VOLTAGE	250	250	5.0	50	200	25	---	30	10	1.00	30	90*	---	---	---	---
BF259	NPN HIGH VOLTAGE	300	300	5.0	50	250	25	---	30	10	1.00	30	90*	---	---	---	---
BF337	NPN HIGH VOLTAGE	250	200	5.0	100****	200	20	---	30	10	---	---	---	---	---	---	---
BFR36	NPN AMPL/SWITCH	40	30	3.0	0.15	20	60	---	70	5.0	---	---	1.0	---	---	---	4.0*
BFS89	NPN HIGH VOLTAGE	300	300	5.0	0.05	250	25	---	50	10	---	---	---	---	---	---	---
BFS95	PNP AMPL/SWITCH	40	35	6.0	0.05	30	15	---	1,000	10	0.20	150	---	---	---	---	---
BFT28C	PNP HIGH VOLTAGE	300	250	---	5.00	150	20	---	10	10	5.00	30	25	---	---	---	---
BFW16A	NPN AMPL/SWITCH	40	25	3.0	20	20	25	---	50	5.0	---	---	1.2*	---	---	---	6.0
BFW44	PNP AMPL/SWITCH	150	150	6.0	0.01	100	40	---	10	10	0.50	10	60	7.0	---	---	---
BFX34	NPN AMPL/SWITCH	120	60	6.0	10**	60	40	150	2,000	2.0	1.00	5,000	70	100	600	1,200	---
BFX84	NPN AMPL/SWITCH	100	60	6.0	0.50	100	30	---	150	10	1.00	500	50	12	---	---	---
BFX85	NPN AMPL/SWITCH	100	60	6.0	0.50	100	70	---	150	10	1.00	500	50	12	---	---	---

Small Signal Transistors

TO-39 Case (Continued)

TYPE NO.	DESCRIPTION	V_{CBO} (V)	V_{CEO} (V) *V_{CER}	V_{EBO} (V)	I_{CBO} @ V_{CBO} (μA) *I_{CEO} **I_{CES} ***I_{CEV} ****I_{CER}	(V)	h_{FE}		@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ @ I_C (V)	(mA)	f_T (MHz) *TYP	C_{ob} (pF) *TYP	t_{on} (ns) *TYP	t_{off} (ns) *TYP	NF (dB) *TYP
		MIN	MIN	MIN			MIN	MAX			MAX		MIN	MAX	MAX	MAX	MAX
BFX86	NPN AMPL/SWITCH	45	35	6.0	0.50	30	70	300	150	10	1.00	500	---	---	---	---	---
BFX87	PNP AMPL/SWITCH	50	50	4.0	0.50	50	40	---	150	10	0.40	150	100	12	60	150	---
BFX88	PNP AMPL/SWITCH	40	40	4.0	0.50	40	40	---	150	10	0.40	150	12	60	150	---	---
BFX98	NPN AMPL/SWITCH	150	150	6.0	0.10	100	15	---	100	10	1.00	25	---	---	---	---	---
BFY50	NPN AMPL/SWITCH	80	35	6.0	0.05	60	30	---	150	10	1.00	1,000	60	12	---	---	---
BFY51	NPN AMPL/SWITCH	60	30	6.0	0.05	40	40	---	150	10	1.60	1,000	50	12	---	---	---
BFY52	NPN AMPL/SWITCH	40	20	6.0	0.05	30	60	---	150	10	1.6	1,000	50	12	---	---	---
BFY55	NPN AMPL/SWITCH	80	35	7.0	0.01	60	40	120	150	10	1.00	1,000	60	12	---	---	---
BFY56A	NPN AMPL/SWITCH	85	55	7.0	0.02**	50	40	120	150	1.0	1.00	1,000	60	25	225	800	---
BFY57	NPN AMPL/SWITCH	125	125	5.0	0.10	100	30	150	30	10	1.50	50	---	---	---	---	---
BFY63	NPN AMPL/SWITCH	30	15	4.0	0.05	20	20	120	50	5.0	0.30	50	---	---	---	---	---
BFY64	PNP AMPL/SWITCH	40	40	5.0	0.03**	25	80	---	10	10	0.50	150	200	10	50	120	---
BFY68A	NPN AMPL/SWITCH	60	25	5.0	0.075	30	75	---	10	10	1.50	150	---	---	---	---	---
BSS44	PNP AMPL/SWITCH	65	60	6.0	500**	60	40	---	2,000	2.0	1.00	5.0	80*	100	65*	450*	---
BSS46	PNP AMPL/SWITCH	85	80	6.0	500**	60	25	---	500	2.0	1.40	5.0	80*	100	65*	450*	---
BSV12	PNP AMPL/SWITCH	80	80	5.0	0.01	80	63	250	100	1.0	0.50	100	---	---	---	---	---
BSV15	PNP AMPL/SWITCH	40	40	5.0	0.10**	40	40	250	100	1.0	1.00	500	50	30	500	---	---
BSV16	PNP AMPL/SWITCH	60	60	5.0	0.10**	60	40	250	100	1.0	1.00	500	50	30	500	---	---
BSV17	PNP AMPL/SWITCH	90	80	5.0	0.10**	80	40	160	100	1.0	1.00	500	50	30	500	---	---
BSV64	NPN HIGH CURRENT	100	80	5.0	10	60	40	---	2,000	2.0	1.00	5,000	100*	80	600	1,200	---
BSW65	NPN HIGH VOLTAGE	80	80	6.0	100	40	40	---	100	5.0	1.00	1,000	80*	35	300*	1,000	---
BSW66	NPN HIGH VOLTAGE	100	100	6.0	100	50	40	---	100	5.0	1.00	1,000	80*	35	500*	1,000	---
BSW67	NPN HIGH VOLTAGE	120	120	6.0	100	60	40	---	100	5.0	1.00	1,000	80*	35	500*	1,000	---
BSW68	NPN HIGH VOLTAGE	150	150	6.0	100	75	40	---	100	5.0	1.00	1,000	80*	35	500*	1,000	---
BSW68A	NPN AMPL/SWITCH	150	150	6.0	100	75	30	---	500	5.0	1.00	1,000	80*	35	500*	1,000	---
BSX45	NPN AMPL/SWITCH	80	40	7.0	0.03**	60	40	250	100	1.0	1.00	1,000	50	25	---	---	3.5*
BSX46	NPN AMPL/SWITCH	100	60	7.0	0.03**	60	40	250	100	1.0	1.00	1,000	50	20	---	---	3.5*
BSX47	NPN AMPL/SWITCH	120	80	7.0	0.03**	80	40	160	100	1.0	0.90	500	50	15	---	---	3.5*
BSX59	NPN CORE DRIVER	70	45	5.0	0.50	40	30	90	500	1.0	1.00	1,000	250	10	35	60	---
BSX60	NPN CORE DRIVER	70	30	5.0	0.50	40	30	90	500	1.0	1.00	1,000	250	10	40	70	---
BSX61	NPN CORE DRIVER	70	45	5.0	0.50	40	30	90	500	1.0	1.30	1,000	250	10	50	100	---
BSX62	NPN HIGH CURRENT	60	40	5.0	0.10**	40	63	250	1,000	1.0	0.80	2,000	30	70	300	1,500	---
BSX63	NPN HIGH CURRENT	80	60	5.0	0.10**	60	63	250	1,000	1.0	0.80	2,000	30	70	300	1,500	---
BSX64	NPN HIGH CURRENT	100	80	5.0	0.10**	80	63	160	1,000	1.0	0.80	2,000	30	70	300	1,500	---
BSX95	NPN AMPL/SWITCH	75	30	7.0	0.01	60	40	120	150	10	0.20	150	100	25	---	---	---
BSX96	NPN AMPL/SWITCH	75	30	7.0	0.01	60	100	300	150	10	0.20	150	100	25	---	---	---
BSY34	NPN AMPL/SWITCH	60	40	5.0	0.07	50	25	---	100	1.0	1.00	500	---	---	---	---	---
BSY51	NPN AMPL/SWITCH	60	25	5.0	0.10	30	40	120	150	10	0.80	150	100*	---	---	---	---

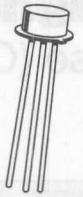
Small Signal Transistors

TO-39 Case (Continued)

TYPE NO.	DESCRIPTION	V_{CBO} (V)	V_{CEO} (V) *V_{CER}	V_{EBO} (V)	I_{CBO} @ V_{CBO} (μA) *I_{CEO} **I_{CES} ***I_{CEV} ****I_{CER}	V_{CBO} (V)	h_{FE}		@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V)	@ I_C (mA)	f_T (MHz) *TYP	C_{ob} (pF) *TYP	t_{on} (ns) *TYP	t_{off} (ns) *TYP	NF (dB) *TYP
		MIN	MIN	MIN			MIN	MAX			MAX		MIN	MAX	MAX	MAX	MAX
BSY52	NPN AMPL/SWITCH	60	25	5.0	0.10	30	100	300	150	10	0.80	150	130*	10	---	---	---
BSY53	NPN AMPL/SWITCH	75	30	7.0	0.01	60	40	120	150	10	0.60	150	100*	10	---	---	---
BSY54	NPN AMPL/SWITCH	75	30	7.0	0.01	60	100	300	150	10	0.60	150	145*	10	---	---	---
BSY55	NPN AMPL/SWITCH	120	80	7.0	0.01	90	40	120	150	10	0.60	150	100*	10	---	---	---
BSY56	NPN AMPL/SWITCH	120	80	7.0	0.01	90	100	300	150	10	0.60	150	145*	10	---	---	---
BSY88	NPN AMPL/SWITCH	100	60	7.0	0.01	75	100	300	150	10	0.60	150	---	---	---	---	---
BUY47	NPN HIGH CURRENT	150	120	6.0	10	80	15	---	5,000	5.0	1.00	5,000	90*	80	1,000	2,000	---
BUY48	NPN HIGH CURRENT	200	170	6.0	10	100	15	---	5,000	5.0	1.00	5,000	90*	80	1,000	2,000	---
BUY49S	NPN HIGH VOLTAGE	250	200	6.0	0.10	200	40	---	500	5.0	0.20	500	50	30	300	1,000	---
BUY68	NPN HIGH CURRENT	100	60	6.0	1.00	60	40	250	1,000	1.0	1.00	5,000	50	80	350	750	---
MJ 420	NPN HIGH VOLTAGE	275	250	6.0	100	275	25	250	30	20	5.00	30	15	12	---	---	---
MJ 420S	NPN HIGH VOLTAGE	275	250	6.0	100	275	25	250	30	20	5.00	30	150	12	---	---	---
MJ 421	NPN HIGH VOLTAGE	350	325	6.0	100	350	25	250	30	20	5.00	30	15	12	---	---	---
MJ 421S	NPN HIGH VOLTAGE	350	325	6.0	100	350	25	250	30	20	5.00	30	15	12	---	---	---
MM 420	NPN HIGH VOLTAGE	275	250	6.0	100	275	25	250	30	20	5.00	30	15	12	---	---	---
MM 421	NPN HIGH VOLTAGE	350	325	6.0	100	350	25	250	30	20	5.00	30	15	12	---	---	---
MM3000	NPN HIGH VOLTAGE	100	100	5.0	1.00	50	20	---	10	10	---	---	150	7.0	---	---	---
MM3001	NPN HIGH VOLTAGE	150	150	5.0	1.00	75	20	---	10	10	---	---	150	7.0	---	---	---
MM3002	NPN HIGH VOLTAGE	200	200	5.0	5.00	100	20	---	10	10	---	---	150	15	---	---	---
MM3003	NPN HIGH VOLTAGE	250	250	5.0	5.00	100	20	---	10	10	---	---	150	15	---	---	---
MM3005	NPN AMPL/SWITCH	80	60	5.0	100	60	50	250	150	1.0	0.35	150	50	15	---	---	---
MM3006	NPN AMPL/SWITCH	100	80	5.0	100	80	50	250	200	1.0	0.35	150	50	15	---	---	---
MM3007	NPN AMPL/SWITCH	120	100	5.0	100	100	50	250	250	1.0	0.35	150	50	15	---	---	---
MM3008	NPN HIGH VOLTAGE	120	120	6.0	0.10	120	30	---	1.0	10	---	---	50	3.0	---	---	---
MM3009	NPN HIGH VOLTAGE	180	180	6.0	0.10	180	30	---	1.0	10	---	---	50	3.0	---	---	---
MM4000	PNP HIGH VOLTAGE	100	100	4.0	1.00	50	20	---	10	10	0.60	10	---	6.0	---	---	---
MM4001	PNP HIGH VOLTAGE	150	150	4.0	1.00	75	20	---	10	10	0.60	10	---	10	---	---	---
MM4002	PNP HIGH VOLTAGE	200	200	4.0	5.00	150	20	---	10	10	5.00	10	---	20	---	---	---
MM4003	PNP HIGH VOLTAGE	250	250	4.0	5.00	150	20	---	10	10	5.00	10	---	20	---	---	---
MM5415	PNP HIGH VOLTAGE	200	200	4.0	50	175	30	150	50	10	2.50	50	15	25	---	---	---
MM5416	PNP HIGH VOLTAGE	350	300	7.0	50	280	30	120	50	10	2.50	50	15	25	---	---	---
SE7001	NPN HIGH VOLTAGE	150	150	5.0	0.10	75	30	---	30	10	2.00	50	40	9.0	---	---	---
SE7002	NPN HIGH VOLTAGE	120	120	5.0	0.10	75	30	---	30	10	0.90	50	40	3.5	---	---	---
SE7056	NPN HIGH VOLTAGE	300	300	7.0	0.10	200	40	100	30	10	1.00	20	40	3.0	---	---	---
40327	NPN HIGH VOLTAGE	300	300*	5.0	0.10	150	40	250	20	10	---	---	---	---	---	---	---
40347	NPN AMPL/SWITCH	60	40	7.0	1.00****	30	20	80	450	4.0	1.00	450	---	---	---	---	---
40348	NPN AMPL/SWITCH	90	65	7.0	1.00****	60	30	100	300	4.0	0.75	300	---	---	---	---	---
40406	PNP AMPL/SWITCH	50	50	4.0	---	---	30	200	0.1	10	---	---	100*	---	---	---	---
40408	NPN AMPL/SWITCH	50	90	4.0	---	---	40	200	10	4.0	1.40	150	100*	---	---	---	---
40412	NPN HIGH VOLTAGE	250	250*	4.0	2.00***	150	40	---	30	20	0.50	10	10	10	---	---	---

Small Signal Transistors

TO-46 Case



TYPE NO.	DESCRIPTION	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (μA) **I_{CEV} MAX	(V)	h_{FE} MIN	h_{FE} MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ MAX	@ I_C (mA)	C_{ob} (pF) MAX	f_T (MHz) MIN	NF (dB) MAX	t_{off} (ns) MAX
2N2604	PNP LOW NOISE	60	45	6.0	0.01	45	40	120	0.01	5.0	0.5	10	6.0	30	4.0	---
2N2605	PNP LOW NOISE	60	45	6.0	0.01	45	100	300	0.01	5.0	0.5	10	6.0	30	3.0	---
2N3485*	PNP AMPL/SWITCH	60	40	5.0	0.02	50	40	120	150	10	1.6	500	8.0	200	---	180
2N3485A*	PNP AMPL/SWITCH	60	60	5.0	0.01	50	40	120	150	10	1.6	500	8.0	200	---	180
2N3486*	PNP AMPL/SWITCH	60	40	5.0	0.02	50	100	300	150	10	1.6	500	8.0	200	---	180
2N3486A*	PNP AMPL/SWITCH	60	60	5.0	0.01	50	100	300	150	10	1.6	500	8.0	200	---	180
2N3508	NPN SAT SWITCH	40	20	6.0	0.2	20	40	120	10	1.0	0.45	100	4.0	500	---	28
2N3509*	NPN SAT SWITCH	40	20	6.0	0.2	20	100	300	10	1.0	0.45	100	4.0	500	---	28
2N3647*	NPN SAT SWITCH	40	10	6.0	0.025**	10	25	150	150	1.0	0.6	300	4.0	350	---	25
2N3648*	NPN SAT SWITCH	40	15	6.0	0.025**	10	30	120	150	1.0	0.8	500	4.0	450	---	18
2N3673*	NPN AMPL/SWITCH	60	50	5.0	0.01	50	75	225	150	10	1.6	500	9.0	200	---	100
2N3736*	NPN SAT SWITCH	50	30	5.0	0.2**	25	30	120	1,000	1.5	0.9	1,000	9.0	250	---	60
2N3737*	NPN SAT SWITCH	75	50	5.0	0.2**	40	20	80	1,000	1.5	0.9	1,000	9.0	250	---	60
2N4449*	NPN AMPL/SWITCH	40	15	4.5	0.4	20	40	---	10	1.0	0.18	10	4.0	500	---	12
2N5581*	NPN AMPL/SWITCH	75	40	6.0	0.01	50	40	120	150	10	1.6	500	8.0	250	---	285
2N5582	NPN AMPL/SWITCH	75	40	6.0	0.01	50	100	300	150	10	1.6	500	8.0	300	---	285

* Available on special order; please consult factory.

Small Signal NPN Transistors

TO-72 Case

TYPE NO.	DESCRIPTION	V_{CBO} (V) MIN	V_{CEO} (V) MIN	V_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (μA) MAX	(V)	h_{FE} MIN	MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V) MAX	@ I_C (mA)	f_T (MHZ) MIN	C_{ob} *C_{cb} (pF) MAX
2N917	RF/IF OSCILLATOR	30	15	3.0	0.001	15	20	---	3.0	1.0	0.5	3.0	500	1.7
2N917A	RF/IF OSCILLATOR	30	15	3.0	---	---	20	200	3.0	10	---	---	600	1.7
2N918	RF/IF OSCILLATOR	30	15	3.0	0.01	15	20	---	3.0	1.0	0.4	10	600	1.7
2N998	DARLINGTON	100	60	15	0.01	90	1,600	8,000	10	5.0	1.8	100	60	30
2N2857	VHF/UHF OSC	30	15	2.5	0.01	15	30	150	3.0	1.0	---	---	1,000	1.0*
2N2865	RF/IF OSCILLATOR	25	13	3.0	0.01	15	20	200	4.0	10	0.4	10	600	2.5
2N3478	VHF/UHF LOW NOISE	30	15	2.0	0.02	1.0	25	150	2.0	8.0	---	---	750	1.0*
2N3839	VHF/UHF AMPL/OSC	30	15	2.5	0.01	15	30	150	3.0	1.0	---	---	1,000	1.0*
2N5179	VHF/UHF AMPL/OSC	20	12	2.5	0.02	15	25	250	3.0	1.0	0.4	10	900	1.0*
BFY90	VHF/UHF AMPL/OSC	30	15	2.5	0.01	15	20	125	25	1.0	---	---	1,000	1.5*

Shaded areas indicate Darlington.

Dual Transistors

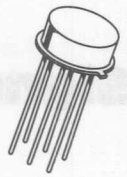
TO-71 Case

P_D @ T_A= 25°C=360mW Total (Both Die Equal Power)

TYPE NO.	DESCRIPTION	V_{CBO} (V) MIN	V_{CEO} (V) MIN	V_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (nA) MAX	(V)	h_{FE} MIN	MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V) MAX	@ I_C (mA)	MATCHING h_{FE} %	V_{BE} (mV)
CEN741	NPN LOW NOISE	45	45	6.0	10	45	150	600	0.01	5.0	0.35	1.0	20	5.0
CEN832	PNP LOW NOISE	60	60	5.0	10	50	150	450	1.0	5.0	0.25	1.0	20	5.0

Dual Transistors

TO-78 Case

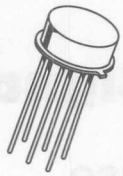


P_D @ T_A=25°C=600mW Total (Both Die Equal Power)

TYPE NO.	DESCRIPTION	I_C (mA)	V_{CBO} (V)	V_{CEO} (V)	h_{FE}		@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V)	@ I_C (mA)	f_T (MHz)	MATCHING H_{FE}	MATCHING V_{BE}
		MAX	MIN	MIN	MIN	MAX			MAX		*TYP MIN	%	(mV)
2N2060	NPN AMPL/SWITCH	500	100	60	50	150	10	5.0	1.2	50	60	10	5.0
2N2060A	NPN AMPL/SWITCH	500	100	60	50	150	10	5.0	0.6	50	60	10	3.0
2N2223	NPN AMPL/SWITCH	500	100	60	50	200	10	5.0	1.2	50	50	20	15
2N2223A	NPN AMPL/SWITCH	500	100	60	50	200	10	5.0	1.2	50	50	10	5.0
2N2453	NPN LOW NOISE	50	60	30	150	600	1.0	5.0	1.0	5.0	60	10	3.0
2N2453A	NPN LOW NOISE	50	80	50	150	600	1.0	5.0	1.0	5.0	60	10	3.0
2N2480	NPN AMPL/SWITCH	500	75	35	30	350	1.0	5.0	1.3	50	50	20	10
2N2480A	NPN AMPL/SWITCH	500	80	40	50	200	1.0	5.0	1.2	50	50	20	5.0
2N2639	NPN LOW NOISE	30	45	45	50	300	0.01	5.0	1.0	10	40	10	5.0
2N2640	NPN LOW NOISE	30	45	45	50	300	0.01	5.0	1.0	10	40	20	10
2N2641	NPN LOW NOISE	30	45	45	50	300	0.01	5.0	1.0	10	40	---	---
2N2642	NPN LOW NOISE	30	45	45	100	300	0.01	5.0	1.0	10	40	10	5.0
2N2643	NPN LOW NOISE	30	45	45	100	300	0.01	5.0	1.0	10	40	20	10
2N2644	NPN LOW NOISE	30	45	45	100	300	0.01	5.0	1.0	10	40	---	---
2N2652	NPN AMPL/SWITCH	500	100	60	50	200	1.0	5.0	1.2	50	60	15	3.0
2N2652A	NPN AMPL/SWITCH	500	100	60	50	200	1.0	5.0	1.2	50	60	10	3.0
2N2722	NPN LOW NOISE	40	45	45	50	250	0.001	5.0	1.0	10	100	10	5.0
2N2903	NPN LOW NOISE	50	60	30	125	625	1.0	5.0	1.0	5.0	60	20	10
2N2903A	NPN LOW NOISE	50	60	30	125	625	1.0	5.0	1.0	5.0	60	10	5.0
2N2913	NPN LOW NOISE	30	45	45	60	240	0.01	5.0	0.35	1.0	60	---	---
2N2914	NPN LOW NOISE	30	45	45	150	600	0.01	5.0	0.35	1.0	60	---	---
2N2915	NPN LOW NOISE	30	45	45	60	240	0.01	5.0	0.35	1.0	60	10	3.0
2N2915A	NPN LOW NOISE	30	45	45	60	240	0.01	5.0	0.35	1.0	60	10	1.5
2N2916	NPN LOW NOISE	30	45	45	150	600	0.01	5.0	0.35	1.0	60	10	3.0
2N2916A	NPN LOW NOISE	30	45	45	150	600	0.01	5.0	0.35	1.0	60	10	1.5
2N2917	NPN LOW NOISE	30	45	45	60	240	0.01	5.0	0.35	1.0	60	20	5.0
2N2918	NPN LOW NOISE	30	45	45	150	600	0.01	5.0	0.35	1.0	60	20	5.0
2N2919	NPN LOW NOISE	30	60	60	60	240	0.01	5.0	0.35	1.0	60	10	3.0
2N2919A	NPN LOW NOISE	30	60	60	60	240	0.01	5.0	0.35	1.0	60	10	1.5
2N2920	NPN LOW NOISE	30	60	60	150	600	0.01	5.0	0.35	1.0	60	10	3.0
2N2920A	NPN LOW NOISE	30	60	60	150	600	0.01	5.0	0.35	1.0	60	10	1.5
2N3726	PNP LOW NOISE	300	45	45	135	350	1.0	5.0	0.25	50	200	10	5.0
2N3727	PNP LOW NOISE	300	45	45	135	350	1.0	5.0	0.25	50	200	10	2.5
2N3806	PNP LOW NOISE	50	60	60	150	450	1.0	5.0	0.2	0.1	100	---	---
2N3807	PNP LOW NOISE	50	60	60	300	900	1.0	5.0	0.2	0.1	100	---	---
2N3808	PNP LOW NOISE	50	60	60	150	450	1.0	5.0	0.2	0.1	100	20	5.0
2N3809	PNP LOW NOISE	50	60	60	300	900	1.0	5.0	0.2	0.1	100	20	5.0
2N3810	PNP LOW NOISE	50	60	60	150	450	1.0	5.0	0.2	0.1	100	10	3.0
2N3810A	PNP LOW NOISE	50	60	60	150	450	1.0	5.0	0.2	0.1	100	5.0	1.5
2N3811	PNP LOW NOISE	50	60	60	300	900	1.0	5.0	0.2	0.1	100	10	3.0
2N3811A	PNP LOW NOISE	50	60	60	300	900	1.0	5.0	0.2	0.1	100	5.0	1.5
2N4015	PNP AMPL/SWITCH	300	60	60	135	350	1.0	5.0	0.25	50	200	10	5.0
2N4016	PNP AMPL/SWITCH	300	60	60	135	350	1.0	5.0	0.25	50	200	10	2.5
2N5794	NPN AMPL/SWITCH	600	75	40	100	300	150	10	0.3	150	250	---	---
2N5796	PNP AMPL/SWITCH	600	60	60	100	300	150	10	0.4	150	200	---	---
MD708	NPN SAT SWITCH	200	40	15	40	200	10	1.0	0.5	100	300	---	---
MD708A	NPN SAT SWITCH	200	40	15	40	200	10	1.0	0.5	100	300	10	5.0
MD708B	NPN SAT SWITCH	200	40	15	40	200	10	1.0	0.5	100	300	20	10

Dual Transistors

TO-78 Case (Continued)



TYPE NO.	DESCRIPTION	I_C (mA)	V_{CBO} (V)	V_{CEO} (V)	h_{FE}		@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ @ I_C (V)	(mA)	f_T (MHz)	MATCHING H_{FE}	V_{BE}
		MAX	MIN	MIN	MIN	MAX			MAX		*TYP MIN	%	(mV)
MD982	PNP AMPL/SWITCH	600	60	50	35	---	10	10	0.5	150	200	---	---
MD2219A	NPN AMPL/SWITCH	500	60	30	100	300	150	10	0.4	150	200	---	---
MD2369	NPN SAT SWITCH	500	40	15	40	140	10	1	0.25	10	500	---	---
MD2369A	NPN SAT SWITCH	500	40	15	40	140	10	1	0.25	10	500	10	5.0
MD2369B	NPN SAT SWITCH	500	40	15	40	140	10	1	0.25	10	500	20	10
MD2905A	PNP AMPL/SWITCH	600	60	60	100	300	150	10	0.4	150	200	---	---
NEW MD5179	NPN VHF/UHF OSC	50	20	12	25	---	3.0	1.0	0.4	10	900	10	10
MD7000	NPN AMPL/SWITCH	500	50	30	40	---	300	30	0.4	150	200	---	---
MD7001	PNP AMPL/SWITCH	600	50	30	40	---	300	30	0.4	150	200	---	---
MD7002	NPN LOW NOISE	30	50	40	40	---	0.1	10	0.35	10	200	---	---
MD7002A	NPN LOW NOISE	30	50	40	40	---	0.1	10	0.35	10	200	25	25
MD7002B	NPN LOW NOISE	30	50	40	40	---	0.1	10	0.35	10	200	15	15
MD7003	PNP LOW NOISE	50	50	40	40	---	0.1	10	0.35	10	200	---	---
MD7003A	PNP LOW NOISE	50	50	40	40	---	0.1	10	0.35	10	200	25	25
MD7003B	PNP LOW NOISE	50	50	40	40	---	0.1	10	0.35	10	200	15	15
MD8001	NPN LOW NOISE	30	40	40	100	---	1.0	10	---	---	260*	---	15
MD8002	NPN LOW NOISE	30	50	50	100	---	1.0	10	---	---	260*	---	15
MD8003	NPN LOW NOISE	30	60	60	100	---	1.0	10	---	---	260*	---	15

Available on Special Order. Please Consult Factory.			
2N4854*	MD984	MD3250,A	MD6502
2N4937	MD985*	MD3251,A	MD7004
2N4938	MD986	MD3725	MD7005
2N4939	MD1123	MD6002	MD7007,A,B
2N6502	MD1130	MD6003	MD7021*
MD918,A,B	MD1132	MD6100*	

* NPN/PNP Complementary Types.

Small Signal Transistors

TO-92 Case

TO-92

TYPE NO.	FAMILY	LEAD CODE	V_{CBO} (V) MIN	V_{CEO} (V) *V_{CES} MIN	V_{EBO} (V) MIN	I_{CBO} (nA) *I_{CES} **I_{CEV} MAX	@ V_{CBO} (V)	h_{FE} MIN	h_{FE} *h_{fe}(1kHZ) MAX	@ V_{CE} (V)	@ I_C (mA)	$V_{CE(SAT)}$ (V)	@ I_C (mA)	C_{ob} (pF) *C_{rb} MAX	f_T (MHz) *TYP MIN	NF (dB) MAX	t_{off} MAX
2N2712	NPN AMPL/SWITCH	ECB	18	18	5.0	500	18	75	250	----	----	---	---	12		2.8	---
2N2714	NPN AMPL/SWITCH	ECB	18	18	5.0	100	18	75	250	0.30	50	1.20	50	---	---	---	---
2N2923	NPN LOW NOISE	ECB	25	25	5.0	100	25	90*	180*	---	---	---	---	10	160*	----	---
2N2924	NPN LOW NOISE	ECB	25	25	5.0	100	25	150*	300*	---	---	---	---	10	160*	----	---
2N2925	NPN LOW NOISE	ECB	25	25	5.0	100	25	235*	470*	---	---	---	---	10	160*	2.8	---
2N2926	NPN LOW NOISE	ECB	25	25	5.0	500	18	35*	470*	---	---	---	---	10	120*	2.8	---
2N3391A	NPN LOW NOISE	ECB	25	25	5.0	100	25	250	500	4.50	2.0	----	---	10	120*	5.0	---
2N3392	NPN LOW NOISE	ECB	25	25	5.0	100	25	150	300	4.50	2.0	----	---	10	120*	---	---
2N3393	NPN LOW NOISE	ECB	25	25	5.0	100	25	90	180	4.50	2.0	---	---	10	120*	---	---
2N3395	NPN LOW NOISE	ECB	25	25	5.0	100	25	150	500	4.50	2.0	---	---	10	---	---	---
2N3396	NPN LOW NOISE	ECB	25	25	5.0	100	25	90	500	4.50	2.0	---	---	10	---	---	---
2N3397	NPN LOW NOISE	ECB	25	25	5.0	100	25	55	500	4.50	2.0	---	---	10	---	---	---
2N3398	NPN LOW NOISE	ECB	25	25	5.0	100	25	55	800	4.50	2.0	---	---	10	---	---	---
2N3415	NPN LOW NOISE	ECB	25	25	5.0	100	25	180	540	4.50	2.0	0.30	50	---	---	---	---
2N3416	NPN LOW NOISE	ECB	50	50	5.0	100	25	75	225	4.50	2.0	0.30	50	---	---	---	---
2N3417	NPN LOW NOISE	ECB	50	50	5.0	100	50	180	540	4.50	2.0	0.30	50	---	---	---	---
2N3702	PNP AMPL/SWITCH	ECB	40	25	5.0	100	20	60	300	5.0	0.05	0.25	50	12	100	---	---
2N3703	PNP AMPL/SWITCH	ECB	50	30	5.0	100	20	30	300	5.0	0.05	0.25	50	12	100	----	----
2N3704	NPN AMPL/SWITCH	ECB	50	30	5.0	100	20	100	300	2.0	50	0.60	100	12	100	----	----
2N3705	NPN AMPL/SWITCH	ECB	50	30	5.0	100	20	50	300	2.0	50	0.80	100	12	100	----	----
2N3706	NPN AMPL/SWITCH	ECB	40	20	5.0	100	20	30	600	2.0	50	1.0	100	12	100	----	----
2N3707	NPN LOW NOISE	ECB	30	30	6.0	100	20	100	400	5.0	1.0	1.0	10	----	----	5.0	----
2N3708	NPN LOW NOISE	ECB	30	30	6.0	100	20	45	660	5.0	1.0	1.0	10	----	----	5.0	----
2N3709	NPN LOW NOISE	ECB	30	30	6.0	100	20	45	165	5.0	1.0	1.0	10	----	----	5.0	----
2N3710	NPN LOW NOISE	ECB	30	30	6.0	100	20	90	330	5.0	1.0	1.0	10	----	----	5.0	----
2N3711	NPN LOW NOISE	ECB	30	30	6.0	100	20	180	660	5.0	1.0	1.0	10	----	----	5.0	----
2N3859A	NPN LOW NOISE	ECB	60	60	6.0	50	60	100	200	4.50	2.0	0.125	10	4.0	----	5.0	----
2N3860	NPN LOW NOISE	ECB	30	30	4.0	50	30	150	300	4.50	2.0	0.125	10	4.0	90	----	----
2N3903	NPN AMPL/SWITCH	EBC	60	40	6.0	50**	30	50	150	1.0	10	0.30	50	4.0	250	6.0	225
2N3904	NPN AMPL/SWITCH	EBC	60	40	6.0	50**	30	100	300	1.0	10	0.30	50	4.0	300	5.0	250
2N3905	PNP AMPL/SWITCH	EBC	40	40	5.0	50**	30	50	150	1.0	10	0.40	50	4.5	200	5.0	260
2N3906	PNP AMPL/SWITCH	EBC	40	40	5.0	50**	30	100	300	1.0	10	0.40	50	4.5	250	4.0	300
2N4058	PNP LOW NOISE	ECB	30	30	6.0	100	20	100	400	5.0	0.10	0.70	10	----	----	5.0	----
2N4123	NPN AMPL/SWITCH	EBC	40	30	5.0	50	20	50	150	1.0	2.0	0.30	50	4.0	250	6.0	---
2N4124	NPN AMPL/ SWITCH	EBC	30	25	5.0	50	20	120	360	1.0	2.0	0.30	50	4.0	300	5.0	---
2N4125	PNP AMPL/SWITCH	EBC	30	30	4.0	50	20	50	150	1.0	2.0	0.40	50	4.5	200	5.0	---
2N4126	PNP AMPL/SWITCH	EBC	25	25	4.0	50	20	120	360	1.0	2.0	0.40	50	4.5	250	4.0	---
2N4264	NPN SAT SWITCH	EBC	30	15	6.0	100**	12	40	160	1.0	10	0.35	100	4.0	350	----	35
2N4287	NPN LOW NOISE	ECB	45	45	7.0	10	30	150	600	5.0	1.0	0.35	1.0	6.0	40	5.0	----
2N4289	PNP LOW NOISE	ECB	60	45	7.0	10	45	150	600	0.35	1.0	0.80	1.0	8.0	40	4.0	----
2N4400	NPN AMPL/SWITCH	EBC	60	40	6.0	100*	35	50	150	1.0	150	0.75	500	6.5	200	---	255

Devices are available lead formed. See pages 217 and 218 for details.

Small Signal Transistors

TO-92 Case (Continued)

TO-92

TO-92-18R

TYPE NO.	FAMILY	LEAD CODE	V_{CBO}	V_{CEO}	V_{EBO}	I_{CBO} @ V_{CBO}		h_{FE}		@ V_{CE}	@ I_C	$V_{CE(SAT)}$ @ I_C		C_{ob}	f_T	NF	t_{off}
			(V)	(V)	(V)	(nA)	(V)			(V)	(mA)	(V)	(mA)	(pF)	(MHz)		
		*TO-92-18R	MIN	*V_{CES} MIN	MIN	*I_{CES} **I_{CEV}		MIN	*h_{fe}(1kHZ) MAX					*C_{rb} MAX	*TYP MIN	MAX	MAX
2N4401	NPN AMPL/SWITCH	EBC	60	40	6.0	100*	35	100	300	1.0	150	0.75	500	6.5	250	---	255
2N4402	PNP AMPL/SWITCH	EBC	40	40	5.0	100*	35	50	150	2.0	150	0.75	500	8.5	150	---	255
2N4403	PNP AMPL/SWITCH	EBC	40	40	5.0	100*	35	100	300	2.0	150	0.75	500	8.5	200	---	255
2N4410	NPN LOW NOISE	EBC	120	80	5.0	10	100	60	400	1.0	10	0.20	1.0	12	60	---	---
2N4424	NPN LOW NOISE	ECB	60	40	5.0	30	40	180	540	0.45	0.30	50	----	----	----	----	----
2N4952	NPN AMPL/SWITCH	ECB	60	30	5.0	50	40	100	300	10	150	0.30	150	8.0	250	----	400
2N4953	NPN AMPL/SWITCH	ECB	60	30	5.0	50	40	200	600	10	150	0.30	150	8.0	250	----	400
2N5086	PNP LOW NOISE	EBC	50	50	3.0	10	10	150	500	5.0	0.10	0.30	10	4.0	40	3.0	---
2N5087	PNP LOW NOISE	EBC	50	50	3.0	10	10	250	800	5.0	0.10	0.30	10	4.0	40	2.0	---
2N5088	NPN LOW NOISE	EBC	35	30	4.5	50	20	300	900	5.0	0.10	0.50	10	4.0	50	3.0	---
2N5089	NPN LOW NOISE	EBC	30	25	4.5	50	15	400	1,200	5.0	0.10	0.50	10	4.0	50	2.0	---
2N5172	NPN LOW NOISE	ECB	25	25	5.0	100	25	100	500	10	10	0.25	10	13	200*	---	---
2N5209	NPN LOW NOISE	EBC	50	50	4.5	50	35	100	300	5.0	0.10	0.70	10	4.0	30	3.0	---
2N5210	NPN LOW NOISE	EBC	50	50	4.5	50	35	200	600	5.0	0.10	0.70	10	4.0	30	2.0	---
2N5223	NPN AMPL/SWITCH	EBC	25	20	3.0	100	10	50	800	0.70	10	1.20	10	4.0	150	----	----
2N5225	NPN AMPL/SWITCH	EBC	25	25	4.0	300	15	30	600	10	50	0.80	100	20	50	----	----
2N5226	PNP AMPL/SWITCH	EBC	25	25	4.0	300	15	30	600	10	50	0.80	100	8.0	50	----	----
2N5227	PNP LOW NOISE	EBC	30	30	3.0	100	10	50	700	10	2.0	0.40	10	10	100	----	5.0
2N5232A	NPN LOW NOISE	ECB	70	50	5.0	30	50	250	500	5.0	2.0	0.125	10	4.0	----	5.0	----
2N5306	NPN DARLINGTON	ECB	25	25	12	100	25	7,000	70,000	5.0	2.0	1.40	200	10	60	----	----
2N5308	NPN DARLINGTON	ECB	40	40	12	100	40	7,000	70,000	5.0	2.0	1.40	200	10	60	----	----
2N5356	PNP AMPL/SWITCH	ECB	25	25	4.0	100	25	250	500	1.0	50	0.25	50	8.0	250*	----	----
2N5366	PN AMPL/SWITCH	ECB	40	40	4.0	100	40	100	300	1.0	50	0.25	50	8.0	250*	----	----
2N5367	PNP AMPL/SWITCH	ECB	40	40	4.0	100	40	250	500	1.0	50	0.25	50	8.0	250*	----	----
2N5374	PNP AMPL/SWITCH	CBE*	60	30	5.0	50	40	200	400	10	150	0.30	150	10	150	----	----
2N5375	PNP AMPL/SWITCH	CBE*	40	30	5.0	50	30	40	400	10	150	0.30	150	10	150	----	----
2N5376	NPN AMPL/SWITCH	CBE*	60	30	5.0	10	30	120	----	5.0	1.0	----	----	8.0	----	----	----
2N5377	NPN AMPL/SWITCH	CBE*	60	30	5.0	10	30	120	----	5.0	1.0	----	----	8.0	----	----	----
2N5381	NPN AMPL/SWITCH	CBE*	60	40	6.0	50	30	100	300	1.0	10	12	10	4.0	300	5.0	----
2N5383	PNP AMPL/SWITCH	CBE*	40	40	5.0	50	30	100	300	1.0	10	0.25	10	4.5	250	4.0	----
2N5400	PNP HIGH VOLTAGE	EBC	130	120	5.0	100	100	40	240	5.0	10	0.50	50	6.0	100	8.0	---
2N5401	PNP HIGH VOLTAGE	EBC	160	150	5.0	50	120	60	240	5.0	10	0.50	50	6.0	100	8.0	---
2N5447	PNP AMPL/SWITCH	CBE*	40	25	5.0	100	20	60	300	5.0	50	0.25	50	12	100	----	----
2N5550	NPN HIGH VOLTAGE	EBC	160	140	6.0	100	100	60	250	5.0	10	0.25	50	6.0	100	10	---
2N5551	NPN HIGH VOLTAGE	EBC	180	160	6.0	50	120	80	250	5.0	10	0.20	50	6.0	100	8.0	---
2N5769	NPN SAT SWITCH	EBC	40	15	4.5	400	20	40	120	0.35	10	0.50	100	4.0	500	----	18
2N5770	NPN RF OSC	EBC	30	15	3.0	10	15	50	200	1.0	8.0	0.40	10	1.1	800	---	---
2N5771	PNP SAT SWITCH	EBC	15	15	4.5	10	8.0	50	120	0.30	10	0.60	50	3.0	850	---	20
2N5772	NPN SAT SWITCH	EBC	40	15	5.0	500*	20	30	120	0.40	30	0.50	300	5.0	350	---	28
2N5810	NPN AMPL/SWITCH	CBE*	35	25	5.0	100	25	60	200	2.0	2.0	0.75	500	15	100	----	----
2N5811	PNP AMPL/SWITCH	CBE*	35	25	5.0	100	25	60	200	2.0	2.0	0.75	500	15	100	----	----

Shaded areas indicate Darlington.

Devices are available lead formed. See pages 217 and 218 for details.

Small Signal Transistors

TO-92 Case (Continued)

TO-92

TO-92-18R

TYPE NO.	FAMILY	LEAD CODE	V_{CBO}	V_{CEO}	V_{EBO}	I_{CBO} @ V_{CBO}		h_{FE}		@ V_{CE}	@ I_C	$V_{CE(SAT)}$ @ I_C		C_{ob}	f_T	NF	t_{off}
			(V)	(V)	(V)	(nA)	(V)			(V)	(mA)	(V)	(mA)	(pF)	(MHz)	(dB)	
		*TO-92-18R	MIN	*V_{CES} MIN	MIN	*I_{CES} **I_{CEV}		MIN	*h_{fe}(1kHZ) MAX					*C_{rb} MAX	*TYP MIN	MAX	MAX
2N5812	NPN AMPL/SWITCH	CBE*	35	25	5.0	100	25	150	500	2.0	2.0	0.75	500	15	135	----	----
2N5813	PNP AMPL/SWITCH	CBE*	35	25	5.0	100	25	150	500	2.0	2.0	0.75	500	15	135	----	----
2N5816	NPN AMPL/SWITCH	CBE*	50	40	5.0	100	25	100	200	2.0	2.0	0.75	500	15	120	----	----
2N5817	PNP AMPL/SWITCH	CBE*	50	40	5.0	100	25	100	200	2.0	2.0	0.75	500	15	120	----	----
2N5818	NPN AMPL/SWITCH	CBE*	50	40	5.0	100	25	150	300	2.0	2.0	0.75	500	15	135	----	----
2N5819	PNP AMPL/SWITCH	CBE*	50	40	5.0	100	25	150	300	2.0	2.0	0.75	500	15	135	----	----
2N5822	NPN AMPL/SWITCH	CBE*	70	60	5.0	100	25	100	200	2.0	2.0	0.75	500	15	120	----	----
2N5823	PNP AMPL/SWITCH	CBE*	70	60	5.0	100	25	100	200	2.0	2.0	0.75	500	15	120	----	----
2N5830	NPN HIGH VOLTAGE	EBC	120	100	5.0	50	100	80	500	5.0	10	0.25	50	4.0	100	----	----
2N5831	NPN HIGH VOLTAGE	EBC	160	140	5.0	50	120	80	500	5.0	10	0.25	50	4.0	100	----	----
2N5961	NPN LOW NOISE	EBC	60	60	8.0	2.0	60	170	700	5.0	10	0.20	10	4.0	100	3.0	---
2N5962	NPN LOW NOISE	EBC	45	45	8.0	2.0	45	600	1,400	5.0	10	0.20	10	4.0	100	3.0	---
2N5963	NPN LOW NOISE	EBC	30	30	8.0	2.0	30	1,200	2,000	5.0	10	0.20	10	4.0	150	3.0	---
2N6076	PNP LOW NOISE	ECB	25	25	5.0	100	25	100	500	10	10	0.25	10	13	200*	---	---
2N6426	NPN DARLINGTON	EBC	40	40	12	50	30	20,000	200,000	5.0	500	1.50	500	7.0	150	10	---
2N6427	NPN DARLINGTON	EBC	40	40	12	50	30	14,000	140,000	5.0	500	1.50	500	7.0	130	10	---
2N6515	NPN HIGH VOLTAGE	EBC	250	250	6.0	50	150	45	220	10	50	1.0	50	6.0	40	---	---
2N6516	NPN HIGH VOLTAGE	EBC	300	300	6.0	50	200	40	200	10	50	1.0	50	6.0	40	---	---
2N6517	NPN HIGH VOLTAGE	EBC	350	350	6.0	50	250	20	100	10	50	1.0	50	6.0	40	---	---
2N6518	PNP HIGH VOLTAGE	EBC	250	250	5.0	50	150	45	220	10	50	1.0	50	6.0	40	---	---
2N6519	PNP HIGH VOLTAGE	EBC	300	300	5.0	50	200	40	200	10	50	1.0	50	6.0	40	---	---
2N6520	PNP HIGH VOLTAGE	EBC	350	350	5.0	50	250	20	100	10	50	1.0	50	6.0	40	---	---
BCX38A	NPN DARLINGTON	EBC	80	60	10	100	60	1,000	---	5.0	500	1.25	800	---	---	---	---
BCX38B	NPN DARLINGTON	EBC	80	60	10	100	60	4,000	---	5.0	500	1.25	800	---	---	---	---
BCX38C	NPN DARLINGTON	EBC	80	60	10	100	60	10,000	---	5.0	500	1.25	800	---	---	---	---
GES6014	NPN AMPL/SWITCH	EBC	70	60	5.0	10	25	100	300	1.0	10	0.50	500	10	105	5.0	400
MPS650	NPN HIGH CURRENT	EBC	60	40	5.0	100	60	40	----	2.0	2,000	0.50	2,000	----	75	----	----
MPS651	NPN HIGH CURRENT	EBC	80	60	5.0	100	80	40	----	2.0	2,000	0.50	2,000	----	75	----	----
MPS750	PNP HIGH CURRENT	EBC	60	40	5.0	100	60	40	----	2.0	2,000	0.50	2,000	----	75	----	----
MPS751	PNP HIGH CURRENT	EBC	80	60	5.0	100	80	40	----	2.0	2,000	0.50	2,000	----	75	----	----
MPS3392	NPN AMPL/SWITCH	EBC	25	25	5.0	100	18	150	300	4.5	2.0	----	----	10	----	----	----
MPS3395	NPN AMPL/SWITCH	EBC	25	25	5.0	100	18	150	500	4.5	2.0	----	----	10	----	----	----
MPS3396	NPN AMPL/SWITCH	EBC	25	25	5.0	100	18	90	500	4.5	2.0	----	----	10	----	----	----
MPS3397	NPN AMPL/SWITCH	EBC	25	25	5.0	100	18	55	500	4.5	2.0	----	----	10	----	----	----
MPS3398	NPN AMPL/SWITCH	EBC	25	25	5.0	100	18	55	800	4.5	2.0	----	----	10	----	----	----
MPS3415	NPN LOW NOISE	EBC	25	25	5.0	100	25	180	540	4.5	2.0	0.30	50	----	----	----	----
MPS3702	PNP AMPL/SWITCH	EBC	40	25	5.0	100	20	60	300	5.0	50	0.25	50	12	100	----	----
MPS3704	NPN AMPL/SWITCH	EBC	50	30	5.0	100	20	100	300	2.0	50	0.60	100	12	100	----	----
MPS3706	NPN AMPL/SWITCH	EBC	40	20	5.0	100	20	30	600	2.0	50	1.0	100	12	100	----	----
MPS3707	NPN LOW NOISE	EBC	30	30	6.0	100	20	100	400	5.0	0.10	1.0	10	4.0	----	5.0	----
MPS3708	NPN LOW NOISE	EBC	30	30	6.0	100	20	45	660	5.0	1.0	1.0	10	----	----	----	----

Shaded areas indicate Darlington.

Devices are available lead formed. See pages 217 and 218 for details.

Small Signal Transistors

TO-92 Case (Continued)

TO-92

TYPE NO.	FAMILY	LEAD CODE	V_{CBO} (V) MIN	V_{CEO} (V) *V_{CES} MIN	V_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (nA) *I_{CES} **I_{CEV}	(V)	h_{FE} @ V_{CE} MIN	*h_{fe}(1kHZ) MAX	(V)	@ I_C (mA)	$V_{CE(SAT)}$ @ I_C (V)	(mA)	C_{ob} (pF) *C_{rb} MAX	f_T (MHz) *TYP MIN	NF (dB) MAX	t_{off} MAX
MPS3710	NPN LOW NOISE	EBC	30	30	6.0	100	20	90	330	5.0	1.0	1.0	10	----	----	----	----
MPS3711	NPN LOW NOISE	EBC	30	30	6.0	100	20	180	660	1.0	1.0	1.0	10	----	----	----	----
MPS3721	NPN LOW NOISE	EBC	18	18	5.0	500	18	60	660	10	2.0	----	----	3.5	----	----	----
MPS3826	NPN AMPL/SWITCH	EBC	60	45	4.0	100	30	40	160	10	10	----	----	3.5	200	----	----
MPS3827	NPN AMPL/SWITCH	EBC	60	45	4.0	100	30	100	400	10	10	----	----	3.5	200	----	----
MPS5172	NPN LOW NOISE	EBC	25	25	5.0	100	25	100	500	10	10	0.25	10	10	120*	----	----
MPS5306	NPN DARLINGTON	EBC	25	25	12	100	25	7,000	70,000	5.0	2.0	1.40	200	10	60	----	----
MPS5308	NPN DARLINGTON	EBC	40	40	12	100	40	7,000	70,000	5.0	2.0	1.40	200	10	60	----	----
MPS6507	NPN RF OSC	EBC	30	20	3.0	50	15	25	----	10	2.0	----	----	2.5	700	----	----
MPS6511	NPN RF OSC	EBC	30	20	3.0	50	15	25	----	10	10	----	----	2.5	----	----	----
MPS6513	NPN AMPL/SWITCH	EBC	40	30	4.0	50	30	90	180	10	2.0	0.50	50	3.5	---	---	---
MPS6514	NPN AMPL/SWITCH	EBC	40	25	4.0	50	30	150	300	10	2.0	0.50	50	3.5	---	---	---
MPS6515	NPN AMPL/SWITCH	EBC	40	25	4.0	50	30	250	500	10	2.0	0.50	50	3.5	---	---	---
MPS6517	PNP AMPL/SWITCH	EBC	40	40	4.0	50	30	90	180	10	2.0	0.50	50	4.0	---	---	---
MPS6518	PNP AMPL/SWITCH	EBC	40	40	4.0	50	30	150	300	10	2.0	0.50	50	4.0	---	---	---
MPS6519	PNP AMPL/SWITCH	EBC	25	25	4.0	50	20	250	500	10	2.0	0.50	50	4.0	---	---	---
MPS6520	NPN LOW NOISE	EBC	40	25	4.0	50	30	200	400	10	2.0	0.50	50	3.5	---	3.0	---
MPS6521	NPN LOW NOISE	EBC	40	25	4.0	50	30	300	600	10	2.0	0.50	50	3.5	---	3.0	---
MPS6522	PNP LOW NOISE	EBC	25	25	4.0	50	20	200	400	10	2.0	0.50	50	3.5	---	3.0	---
MPS6523	PNP LOW NOISE	EBC	25	25	4.0	50	20	300	600	10	2.0	0.50	50	3.5	---	3.0	---
MPS6531	NPN AMPL/SWITCH	EBC	60	40	5.0	50	40	90	270	1.0	100	0.30	100	5.0	---	---	---
MPS6532	NPN AMPL/SWITCH	EBC	50	30	5.0	100	30	30	---	1.0	100	0.50	100	5.0	---	---	---
MPS6534	PNP AMPL/SWITCH	EBC	40	40	4.0	50	30	90	270	1.0	100	0.30	100	7.0	---	---	---
MPS6535	PNP AMPL/SWITCH	EBC	30	30	4.0	50	30	30	---	1.0	100	0.50	100	7.0	---	---	---
MPS6560	NPN AMPL/SWITCH	EBC	25	25	5.0	100	20	50	200	1.0	500	0.50	500	30	60	----	----
MPS6561	NPN AMPL/SWITCH	EBC	20	20	4.0	100	20	50	200	1.0	350	0.50	350	30	60	----	----
MPS6562	PNP AMPL/SWITCH	EBC	25	25	5.0	100	20	50	200	1.0	500	0.50	500	30	60	----	----
MPS6563	PNP AMPL/SWITCH	EBC	20	20	4.0	100	20	50	200	1.0	350	0.50	350	30	60	----	----
MPS6564	NPN AMPL/SWITCH	EBC	---	45	5.0	500	40	25	----	5.0	40	0.50	10	4.0	----	----	----
MPS6566	NPN AMPL/SWITCH	EBC	60	45	4.0	100	30	100	400	10	10	0.40	10	3.5	----	----	----
MPS8097	NPN LOW NOISE	EBC	60	40	6.0	30	40	250	5.0	0.10	----	----	----	4.0	----	2.0	----
MPS8098	NPN AMPL/SWITCH	EBC	60	60	6.0	100	60	100	300	5.0	1.0	0.30	100	6.0	150	----	----
MPS8099	NPN AMPL/SWITCH	EBC	80	80	6.0	100	80	100	300	5.0	1.0	0.30	100	6.0	150	----	----
MPS8598	PNP AMPL/SWITCH	EBC	60	60	5.0	100	60	100	300	5.0	1.0	0.30	100	8.0	150	----	----
MPS8599	PNP AMPL/SWITCH	EBC	80	80	5.0	100	80	100	300	5.0	1.0	0.30	100	8.0	150	----	----
MPSA05	NPN AMPL/SWITCH	EBC	60	60	4.0	100	60	50	---	1.0	100	0.25	100	---	100	---	---
MPSA06	NPN AMPL/SWITCH	EBC	80	80	4.0	100	80	50	---	1.0	100	0.25	100	---	100	---	---
MPSA13	NPN DARLINGTON	EBC	30	30*	10	100	30	10,000	---	5.0	100	1.50	100	---	125	---	---
MPSA14	NPN DARLINGTON	EBC	30	30*	10	100	30	20,000	---	5.0	100	1.50	100	---	125	---	---
MPSA18	NPN LOW NOISE	EBC	45	45	6.5	50	30	500	1,500	5.0	10	----	----	3.0	100	1.5	----
MPSA20	NPN AMPL/SWITCH	EBC	---	40	4.0	100	30	40	400	10	5.0	0.25	10	4.0	125	---	---

Shaded areas indicate Darlington.

Devices are available lead formed. See pages 217 and 218 for details.

Small Signal Transistors

TO-92 Case (Continued)

TO-92

TYPE NO.	FAMILY	LEAD CODE	V_{CBO} (V) MIN	V_{CEO} (V) *V_{CES} MIN	V_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (nA) *I_{CES} **I_{CEV}	(V)	h_{FE} @ V_{CE} (V) MIN	*h_{fe}(1kHZ) MAX	@ I_C (mA)		$V_{CE(SAT)}$ @ I_C (V)	(mA)	C_{ob} (pF) *C_{rb} MAX	f_T (MHz) *TYP MIN	NF (dB) MAX	t_{off} MAX
MPSA25	NPN DARLINGTON	EBC	40	40*	10	100	30	10,000	---	5.0	100	1.50	100	125	---	---	---
MPSA26	NPN DARLINGTON	EBC	50	50*	10	100	40	10,000	---	5.0	100	1.50	100	125	---	---	---
MPSA27	NPN DARLINGTON	EBC	60	50*	10	100	50	10,000	---	5.0	100	1.50	100	125	---	---	---
MPSA28	NPN DARLINGTON	EBC	80	80*	12	100	60	10,000	----	5.0	100	1.50	100	8.0	125	----	----
MPSA29	NPN DARLINGTON	EBC	100	100	12	100	80	10,000	----	5.0	100	1.50	100	8.0	125	----	----
MPSA42	NPN HIGH VOLTAGE	EBC	300	300	6.0	100	200	40	---	10	30	0.50	20	3.0	50	---	---
MPSA44	NPN HIGH VOLTAGE	EBC	500	400	6.0	100	400	50	200	10	10	0.75	50	6.0	20	---	---
MPSA45	NPN HIGH VOLTAGE	EBC	400	350	6.0	100	320	50	200	10	10	0.75	50	6.0	20	---	---
MPSA55	PN AMPL/SWITCH	EBC	60	60	4.0	100	60	50	----	1.0	100	0.25	100	---	50	---	---
MPSA56	PNP AMPL/SWITCH	EBC	80	80	4.0	100	80	50	---	1.0	100	0.25	100	---	50	---	---
MPSA62	PNP DARLINGTON	EBC	20	20*	10	100	15	20,000	---	5.0	10	1.0	10	---	125	---	---
MPSA63	PNP DARLINGTON	EBC	30	30*	10	100	30	10,000	---	5.0	100	1.50	100	---	125	---	---
MPSA64	PNP DARLINGTON	EBC	30	30*	10	100	30	20,000	---	5.0	100	1.50	100	---	125	---	---
MPSA65	PNP DARLINGTON	EBC	30	30*	8.0	100	30	20,000	---	5.0	100	1.50	100	---	100	---	---
MPSA66	PNP DARLINGTON	EBC	30	30*	8.0	100	30	40,000	---	5.0	100	1.50	100	---	100	---	---
MPSA70	PNP LOW NOISE	EBC	---	40	4.0	100	30	40	400	10	5.0	0.25	10	4.0	125	---	---
MPSA75	PNP DARLINGTON	EBC	40	40*	10	100	30	10,000	---	5.0	100	1.50	100	---	125	---	---
MPSA76	PNP DARLINGTON	EBC	50	50*	10	100	40	10,000	---	5.0	100	1.50	100	---	125	---	---
MPSA77	PNP DARLINGTON	EBC	60	60*	10	100	50	10,000	---	5.0	100	1.50	100	---	125	---	---
MPSA92	PNP HIGH VOLTAGE	EBC	300	300	5.0	250	200	25	---	10	30	0.5	20	6.0	50	---	---
MPSD04	NPN DARLINGTON	EBC	---	25*	10	1,000	20	1,000	---	5.0	300	1.0	100	---	100	---	---
MPSD54	PNP DARLINGTON	EBC	---	25*	10	1,000	20	1,000	---	5.0	100	1.0	100	---	100	---	---
MPSH10	NPN RF OSC	BEC	30	25	3.0	100	25	60	---	10	4.0	0.50	4.0	0.65*	650	---	---
MPSH11	NPN RF OSC	BEC	30	25	3.0	100	25	60	---	10	4.0	0.50	4.0	0.90*	650	---	---
MPSL01	NPN HIGH VOLTAGE	EBC	140	120	5.0	1,000	75	50	300	5.0	10	0.30	50	8.0	60	---	---
MPSL51	PNP HIGH VOLTAGE	EBC	100	100	4.0	1,000	50	40	250	5.0	50	0.30	50	8.0	60	---	---
PN918	NPN RF OSC	EBC	30	15	3.0	10	15	20	---	1.0	3.0	0.40	10	1.7	600	6.0	---
PN2222A	NPN AMPL/SWITCH	EBC	75	40	6.0	10	60	100	300	10	150	1.0	500	8.0	300	4.0	285
PN2369A	NPN SAT SWITCH	EBC	40	15	4.5	400	20	40	120	0.35	10	0.50	100	4.0	500	---	18
PN2484	NPN LOW NOISE	EBC	60	60	6.0	10	45	250	----	5.0	1.0	0.30	1.0	6.0	----	3.0	----
PN2907A	PNP AMPL/SWITCH	EBC	60	60	5.0	10	50	100	300	10	150	1.60	500	8.0	200	---	100
PN3563	NPN RF OSC	EBC	30	12	2.0	50	15	20	200	10	8.0	----	---	1.7	600	---	---
PN3564	NPN RF OSC	EBC	30	15	4.0	50	15	20	200	10	15	0.30	20	3.5	400	---	---
PN3565	NPN LOW NOISE	EBC	30	25	6.0	50	25	150	600	10	1.0	0.35	1.0	4.0	40	---	---
PN3566	NPN AMPL/SWITCH	EBC	40	30	5.0	50	20	150	600	10	10	1.0	100	25	40	---	---
PN3567	NPN AMPL/SWITCH	EBC	80	40	5.0	50	40	40	120	1.0	150	0.25	150	20	60	---	---
PN3568	NPN AMPL/SWITCH	EBC	80	60	5.0	50	40	40	120	1.0	150	0.25	150	20	60	---	----
PN3569	NPN AMPL/SWITCH	EBC	80	40	5.0	50	40	100	300	1.0	150	0.25	150	20	60	---	---
PN3638A	PNP AMPL/SWITCH	EBC	25	25	4.0	35*	15	100	---	1.0	50	1.0	300	10	150	---	170
PN3639	PNP SAT SWITCH	EBC	6.0	6.0	4.0	10*	3.0	30	120	0.30	10	0.50	50	3.5	500	---	60
PN3640	PNP SAT SWITCH	EBC	12	12	4.0	10*	6.0	30	120	0.30	10	0.60	50	3.5	500	---	75

Shaded areas indicate Darlington.

Devices are available lead formed. See pages 217 and 218 for details.

Small Signal Transistors

TO-92 Case (Continued)

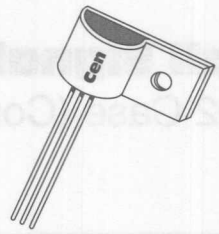
TO-92

TYPE NO.	FAMILY	LEAD CODE	V_{CBO} (V)	V_{CEO} (V) *V_{CES}	V_{EBO} (V)	I_{CBO} @ V_{CBO} (nA) *I_{CES} **I_{CEV}	(V)	h_{FE}	*h_{fe}(1kHZ)	@ V_{CE} (V)	@ I_C (mA)	$V_{CE(SAT)}$ @ I_C (V)	(mA)	C_{ob} (pF) *C_{rb}	f_T (MHz) *TYP	NF (dB)	t_{off}
			MIN	MIN	MIN			MIN	MAX					MAX	MIN	MAX	MAX
PN3641	NPN AMPL/SWITCH	EBC	60	30	5.0	50*	50	40	120	10	150	0.22	150	8.0	150	---	150
PN3642	NPN AMPL/SWITCH	EBC	60	45	5.0	50*	50	40	120	10	150	0.22	150	8.0	150	---	150
PN3643	NPN AMPL/SWITCH	EBC	60	30	5.0	50*	50	100	300	10	150	0.22	150	8.0	250	---	150
PN3644	PNP AMPL/SWITCH	EBC	45	45	5.0	35*	30	100	300	10	150	1.0	300	8.0	200	----	100
PN3645	PNP AMPL/SWITCH	EBC	60	60	5.0	35*	50	100	300	10	150	1.0	300	8.0	200	----	100
PN3646	NPN SAT SWITCH	EBC	40	15	5.0	500*	20	30	120	0.40	30	0.50	300	5.0	350	---	28
PN3694	NPN AMPL/SWITCH	EBC	45	45	4.0	50	30	100	400	10	10	----	----	6.0	200	---	----
PN4249	PNP LOW NOISE	EBC	60	60	5.0	10	40	100	300	5.0	0.10	0.25	10	6.0	40	3.0	---
PN4250A	PNP LOW NOISE	EBC	60	60	5.0	10	50	250	700	5.0	0.10	0.25	10	6.0	50	2.0	---
PN4258	PNP SAT SWITCH	EBC	12	12	4.5	10*	6.0	30	120	3.0	10	0.50	50	3.0	700	---	20
PN4274	NPN SAT SWITCH	EBC	30	12	4.5	400*	20	35	120	1.0	10	0.50	100	4.0	400	---	12
PN4275	NPN SAT SWITCH	EBC	40	15	4.5	400*	20	35	120	1.0	10	0.50	100	4.0	400	---	12
PN4354	PNP AMPL/SWITCH	EBC	60	60	5.0	50	50	50	500	10	10	0.50	500	30	100	3.0	400
PN4355	PNP AMPL/SWITCH	EBC	60	60	5.0	50	50	100	400	10	10	1.0	1,000	30	100	3.0	400
PN4356	PNP AMPL/SWITCH	EBC	80	80	5.0	50	50	50	250	10	10	0.50	500	30	100	3.0	400
PN4916	PNP AMPL/SWITCH	EBC	30	30	5.0	25	15	70	200	1.0	10	0.30	50	4.5	400	4.0	----
PN4917	PNP AMPL/SWITCH	EBC	30	30	5.0	25	15	150	300	1.0	10	0.30	50	4.5	450	4.0	----
PN5127	NPN AMPL/SWITCH	EBC	20	12	3.0	50	10	15	300	10	2.0	0.30	10	3.5	150	----	----
PN5128	NPN AMPL/SWITCH	EBC	15	12	3.0	50	10	35	350	10	50	0.25	150	10	150	----	----
PN5129	NPN AMPL/SWITCH	EBC	15	12	3.0	50	10	35	350	10	50	0.25	150	10	---	----	----
PN5130	NPN RF OSC	EBC	30	12	1.0	50	10	15	250	10	8.0	0.60	10	1.7	----	400	----
PN5131	NPN AMPL/SWITCH	EBC	20	15	3.0	50	10	30	50	1.0	10	1.0	10	6.0	100	----	----
PN5132	NPN AMPL/SWITCH	EBC	20	20	3.0	50	10	30	400	10	10	2.0	10	3.5	200	4.0	----
PN5133	NPN LOW NOISE	EBC	20	18	3.0	50	15	60	1,000	5.0	1.0	0.40	1.0	5.0	40	----	----
PN5134	NPN SAT SWITCH	EBC	20	10	3.5	10,000	15	20	150	1.0	10	0.25	10	4.0	250	----	18
PN5135	NPN AMPL/SWITCH	EBC	30	25	4.0	300	15	50	600	10	10	1.0	100	25	40	----	----
PN5136	NPN AMPL/SWITCH	EBC	30	20	3.0	100	20	20	400	1.0	150	0.25	150	35	40	----	----
PN5137	NPN AMPL/SWITCH	EBC	30	20	3.0	100	20	20	400	1.0	150	0.25	150	35	40	----	----
PN5138	PNP AMPL/SWITCH	EBC	30	30	5.0	50	20	50	800	10	0.10	0.30	10	7.0	30	----	----
PN5139	PNP AMPL/SWITCH	EBC	20	20	5.0	50*	15	40	----	1.0	10	0.50	50	5.0	300	----	200
PN5142	PNP AMPL/SWITCH	EBC	20	20	4.0	50*	12	30	----	1.0	50	2.0	300	10	----	----	200
PN5143	PNP AMPL/SWITCH	EBC	20	20	4.0	50*	12	30	----	1.0	50	2.0	300	10	----	----	200
PN5825	NPN AMPL/SWITCH	EBC	50	40	5.0	50	40	100	200	5.0	2.0	0.125	10	4.0	90	----	----
PN5826	NPN AMPL/SWITCH	EBC	50	40	5.0	50	40	150	300	5.0	2.0	0.125	10	4.0	90	----	----
PN5827	NPN AMPL/SWITCH	EBC	50	40	5.0	50	40	250	500	5.0	2.0	0.125	10	4.0	90	----	----
PN5828	NPN AMPL/SWITCH	EBC	50	40	5.0	50	40	400	800	5.0	2.0	0.125	10	4.0	90	----	----
PN5910	PNP SAT SWITCH	EBC	20	20	4.5	10*	10	30	120	0.30	10	0.50	50	3.0	700	---	20
PN6010	NPN AMPL/SWITCH	EBC	50	40	5.0	10	25	100	300	1.0	10	0.50	500	10	105	5.0	400

Shaded areas indicate Darlington.

Devices are available lead formed. See pages 217 and 218 for details.

Small Signal Transistors



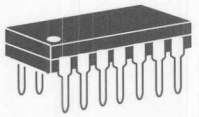
TO-92HS Case

P_D(@T_C=25°C)=1.0Watt

TYPE NO.	POLARITY	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (nA) MAX	(V)	h_{FE} MIN	h_{FE} MAX	@ I_C (mA)	@ V_{CE} (V)	$V_{CE(SAT)}$ @ I_C (V) MAX	(mA)	C_{ob} (pF) MAX	f_T (MHz) MIN	NF (dB) MAX	LEAD CODE
2N3402	NPN	25	25	5.0	100	25	75	225	2.0	4.5	0.3	50	---	---	---	ECB
2N3403	NPN	25	25	5.0	100	25	180	540	2.0	4.5	0.3	50	---	---	---	ECB
2N3404	NPN	50	50	5.0	100	50	75	225	2.0	4.5	0.3	50	---	---	---	ECB
2N3405	NPN	50	50	5.0	100	50	180	540	2.0	4.5	0.3	50	---	---	---	ECB
2N4425	NPN	60	40	5.0	30	40	180	540	2.0	4.5	0.3	50	---	---	---	ECB
HS3402	NPN	25	25	5.0	100	25	75	225	2.0	4.5	0.3	50	---	---	---	EBC
HS3403	NPN	25	25	5.0	100	25	180	540	2.0	4.5	0.3	50	---	---	---	EBC
HS3404	NPN	50	50	5.0	100	50	75	225	2.0	4.5	0.3	50	---	---	---	EBC
HS3405	NPN	50	50	5.0	100	50	180	540	2.0	4.5	0.3	50	---	---	---	EBC
HS5306	NPN	25	25	12	100	25	7,000	70,000	2.0	5.0	1.4	200	10	60	---	ECB
HS5306A	NPN	25	25	12	100	25	7,000	70,000	2.0	5.0	1.4	200	10	60	10	ECB
HS5308	NPN	40	40	12	100	40	7,000	70,000	2.0	5.0	1.4	200	10	60	---	ECB
HS5308A	NPN	40	40	12	100	40	7,000	70,000	2.0	5.0	1.4	200	10	60	10	ECB
GES5810-J1	NPN	35	25	5.0	100	25	60	200	2.0	2.0	0.75	500	15	100	---	EBC
GES5811-J1	PNP	35	25	5.0	100	25	60	200	2.0	2.0	0.75	500	15	100	---	EBC
GES5812-J1	NPN	35	25	5.0	100	25	150	500	2.0	2.0	0.75	500	15	135	---	EBC
GES5813-J1	PNP	35	25	5.0	100	25	150	500	2.0	2.0	0.75	500	15	135	---	EBC
GES5814-J1	NPN	50	40	5.0	100	25	60	160	2.0	2.0	0.75	500	15	100	---	EBC
GES5815-J1	PNP	50	40	5.0	100	25	60	160	2.0	2.0	0.75	500	15	100	---	EBC
GES5816-J1	NPN	50	40	5.0	100	25	100	200	2.0	2.0	0.75	500	15	120	---	EBC
GES5817-J1	PNP	50	40	5.0	100	25	200	200	2.0	2.0	0.75	500	15	120	---	EBC
GES5818-J1	NPN	50	40	5.0	100	25	150	300	2.0	2.0	0.75	500	15	135	---	EBC
GES5819-J1	PNP	50	40	5.0	100	25	150	300	2.0	2.0	0.75	500	15	135	---	EBC
GES5820-J1	NPN	70	60	5.0	100	25	60	160	2.0	2.0	0.75	500	15	100	---	EBC
GES5821-J1	PNP	70	60	5.0	100	25	60	160	2.0	2.0	0.75	500	15	100	---	EBC
GES5822-J1	NPN	70	60	5.0	100	25	100	200	2.0	2.0	0.75	500	15	120	---	EBC
GES5823-J1	PNP	70	60	5.0	100	25	100	200	2.0	2.0	0.75	500	15	120	---	EBC
GES6010-J1	NPN	50	40	5.0	10	25	100	300	10	1.0	0.5	500	10	105	5.0	EBC
GES6011-J1	PNP	50	40	5.0	10	25	100	300	10	1.0	0.75	500	15	75	3.0	EBC
GES6012-J1	NPN	50	40	5.0	10	25	200	500	10	1.0	0.5	500	10	135	3.0	EBC
GES6013-J1	PNP	50	40	5.0	10	25	200	500	10	1.0	0.75	500	15	100	2.0	EBC
GES6014-J1	NPN	70	60	5.0	10	25	100	300	10	1.0	0.5	500	10	105	5.0	EBC
GES6015-J1	PNP	70	60	5.0	10	25	100	300	10	1.0	0.75	500	15	75	3.0	EBC
GES6016-J1	NPN	70	60	5.0	10	25	200	500	10	1.0	0.5	500	10	135	3.0	EBC
GES6017-J1	PNP	70	60	5.0	10	25	200	500	10	1.0	0.75	500	15	100	2.0	EBC
GES6218-J1	NPN	300	300	5.0	500	250	20	---	20	10	1.0	10	5.0	50	---	EBC
GES6219-J1	NPN	250	250	5.0	1,000	200	20	---	20	10	1.0	10	5.0	50	---	EBC
GES6220-J1	NPN	200	200	5.0	1,000	150	20	---	20	10	2.0	20	5.0	50	---	EBC
GES6221-J1	NPN	150	150	5.0	10,000	100	20	---	20	10	2.3	20	5.0	50	---	EBC

NOTE: Most devices are available in CBE lead code on special order.
Shaded areas indicate Darlington.

Quad Transistors*



TO-116 Case (14 Pin Dip)

T_C(@ 25°C)=3.0Watts Total (4 Die Equal Power)

TYPE NO.	DESCRIPTION	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	BV_{EBO} (V) MIN	I_{CBO} @ V_{CBO} (nA) MAX	(V)	h_{FE} MIN	@ I_C (mA)	$V_{CE(SAT)}$ (V) MAX	@ I_C (mA)	C_{ob} (pF) MAX	f_T (MHz) MIN	NF (dB) TYP	t_{OFF} (ns) TYP	COMMENTS	PIN CONFIGURATION**
MPQ2222	NPN AMPL/SWITCH	60	40	5.0	50	50	30	300	0.40	150	8.0	200	--	250	4X 2N2222	A
MPQ2369	NPN SAT SWITCH	40	15	4.5	400	20	20	100	0.25	10	4.0	450	--	15	4X 2N2369	A
MPQ2483	NPN LOW NOISE	60	40	6.0	20	45	150	10	0.50	10	8.0	50	3.0	--	4X 2N2483	A
MPQ2484	NPN LOW NOISE	60	40	6.0	20	45	300	10	0.50	10	8.0	50	2.0	--	4X 2N2484	A
MPQ2907	PNP AMPL/SWITCH	60	40	5.0	50	30	50	300	0.40	150	8.0	200	--	100	4X 2N2907	B
MPQ3467	PNP CORE DRIVER	40	40	5.0	200	30	20	500	0.50	500	25	125	--	80	4X 2N3467	B
MPQ3725	NPN CORE DRIVER	60	40	5.0	500	40	25	500	0.45	500	10	250	--	50	4X 2N3725	A
MPQ3725A	NPN CORE DRIVER	70	50	5.0	500	40	30	500	0.45	500	10	200	--	50	4X 2N3725A	A
MPQ3762	PNP CORE DRIVER	40	40	5.0	100	30	20	1,000	0.55	500	15	150	--	100	4X 2N3762	B
MPQ3904	NPN AMPL/SWITCH	60	40	6.0	50	40	75	10	0.20	10	4.0	250	--	130	4X 2N3904	A
MPQ3906	PNP AMPL/SWITCH	40	40	5.0	50	30	75	10	0.25	10	4.5	200	--	150	4X 2N3906	B
MPQ6002	NPN/PNP AMPL/SWITCH	60	30	5.0	30	50	30	300	0.40	150	8.0	200	--	225	2X 2N2222 + 2X 2N2907	C
MPQ6100A	NPN/PNP LOW NOISE	60	45	5.0	10	50	125	10	0.25	1.0	4.0	50	4.0	--	2X 2N2484 + 2X 2N3799	C
MPQ6502	NPN/PNP AMPL/SWITCH	60	30	5.0	30	50	30	300	0.40	150	8.0	200	--	225	2X 2N2222 + 2X 2N2907	D
MPQ6700	NPN/PNP AMPL/SWITCH	40	40	5.0	50	30	70	10	0.25	10	4.5	200	--	150	2X 2N3904 + 2X 2N3906	D
MPQ7043	NPN HIGH VOLTAGE	250	250	5.0	100	180	40	30	0.50	20	5.0	50	--	--	4X MPSA42	A
MPQ7053	NPN/PNPHIGH VOLTAGE	250	250	5.0	250	180	25	30	0.70	20	6.0	50	--	--	2X MPSA42+ 2X MPSA92	D
MPQ7093	PNP HIGH VOLTAGE	250	250	5.0	250	180	25	30	0.50	20	5.0	50	--	--	4X MPSA92	A

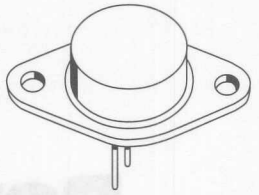
* Not recommended for new designs.

** See mechanical drawing on page 220.

Power Transistors

Power Transistors

TO-3 Case

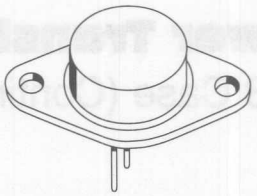


TYPE NO.		I_C	P_D	BV_{CBO}	BV_{CEO}	h_{FE} *TYP		@ I_C	$V_{CE(SAT)}$ @ I_C		f_T *TYP
NPN	PNP	(A) MAX	(W)	(V) MIN	(V) MIN	MIN	MAX	(A)	(V) MAX	(A)	(MHZ) MIN
2N3055	MJ2955	15	115	100	60	5.0	---	10	3.0	10	2.5
2N3442		10	117	160	140	20	70	3.0	5.0	10	---
2N3713	2N3789	10	150	80	60	15	---	3.0	1.0	5.0	4.0
2N3714	2N3790	10	150	100	80	15	---	3.0	1.0	5.0	4.0
2N3715	2N3791	10	150	80	60	30	---	3.0	1.0	5.0	4.0
2N3716	2N3792	10	150	100	80	30	---	3.0	1.0	5.0	4.0
2N3771		30	150	50	40	15	60	15	2.0	15	---
2N3772		20	150	100	60	15	60	10	1.4	10	---
2N3773		16	150	160	140	15	60	8.0	4.0	16	---
2N4913	2N4904	5.0	87.5	40	40	7.0	---	5.0	1.5	5.0	4.0
2N4914	2N4905	5.0	87.5	60	60	7.0	---	5.0	1.5	5.0	4.0
2N4915	2N4906	5.0	87.5	80	80	7.0	---	5.0	1.5	5.0	4.0
2N5067	2N4901	5.0	87.5	40	40	7.0	---	5.0	1.5	5.0	4.0
2N5068	2N4902	5.0	87.5	60	60	7.0	---	5.0	1.5	5.0	4.0
2N5069	2N4903	5.0	87.5	80	80	7.0	---	5.0	1.5	5.0	4.0
2N5301	2N4398	30	200	40	40	15	60	15	4.0	30	4.0
2N5302	2N4399	30	200	60	60	15	60	15	4.0	30	4.0
2N5303	2N5745	20	200	80	80	15	60	10	2.0	20	2.0
2N5629	2N6029	16	200	100	100	25	100	8.0	2.0	16	1.0
2N5632	2N6229	10	150	100	100	25	100	5.0	2.0	10	1.0
2N5877	2N5875	10	150	60	60	4.0	---	10	3.0	10	4.0
2N5878	2N5876	10	150	80	80	4.0	---	10	3.0	10	4.0
2N5881	2N5879	15	160	60	60	4.0	---	15	4.0	15	4.0
2N5882	2N5880	15	160	80	80	4.0	---	15	4.0	15	4.0
2N5885	2N5883	25	200	60	60	20	100	10	4.0	25	4.0
2N5886	2N5884	25	200	80	80	20	100	10	4.0	25	4.0
2N6055	2N6053	8.0	100	60	60	750	18,000	4.0	3.0	8.0	4.0
2N6056	2N6054	8.0	100	80	80	750	18,000	4.0	3.0	8.0	4.0
2N6057	2N6050	12	150	60	60	750	18,000	6.0	3.0	12	4.0
2N6058	2N6051	12	150	80	80	750	18,000	6.0	3.0	12	4.0
2N6059	2N6052	12	150	100	100	750	18,000	6.0	3.0	12	4.0
	2N6246	15	125	70	60	20	100	7.0	2.5	15	4.0
	2N6247	15	125	90	80	20	100	6.0	3.5	15	4.0

Shaded areas indicate Darlington.

Power Transistors

TO-3 Case (Continued)

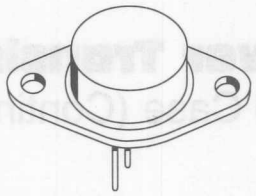


TYPE NO.		I_C	P_D	BV_{CBO}	BV_{CEO}	h_{FE} *TYP		@ I_C	$V_{CE(SAT)}$ @ I_C		f_T *TYP
		(A)	(W)	(V)	(V)			(A)	(V)	(A)	(MHZ)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
	2N6248	10	125	110	100	20	100	5.0	3.5	10	4.0
2N6249		10	175	300	200	10	50	10	1.5	10	2.5
2N6250		10	175	375	275	8.0	50	10	1.5	10	2.5
2N6251		10	175	450	350	6.0	50	10	1.5	10	2.5
2N6253		15	115	55	45	20	70	3.0	4.0	15	4.0
2N6254		15	150	100	80	20	70	5.0	4.0	15	---
2N6282	2N6285	20	160	60	60	750	18,000	10	3.0	20	4.0
2N6283	2N6286	20	160	80	80	750	18,000	10	3.0	20	4.0
2N6284	2N6287	20	160	100	100	750	18,000	10	3.0	20	4.0
2N6306		8.0	125	500	250	15	75	8.0	5.0	8.0	5.0
2N6307		8.0	125	600	300	15	75	8.0	5.0	8.0	5.0
2N6308		8.0	125	700	350	12	60	8.0	5.0	8.0	5.0
2N6371		15	117	50	40	15	60	8.0	4.0	16	4.0
2N6383	2N6648	10	100	40	40	1,000	20,000	5.0	3.0	10	6.0
2N6384	2N6649	10	100	60	60	1,000	20,000	5.0	3.0	10	6.0
2N6385	2N6650	10	100	80	80	1,000	20,000	5.0	3.0	10	6.0
	2N6469	15	125	50	40	20	150	5.0	3.5	15	4.0
2N6470		15	125	50	40	20	150	5.0	3.5	15	4.0
2N6471		15	125	70	60	20	150	5.0	3.5	15	4.0
2N6472		15	125	90	80	20	150	5.0	3.5	15	4.0
2N6542		5.0	100	650	300	7.0	35	3.0	1.0	3.0	6.0
2N6543		5.0	100	850	400	7.0	35	3.0	1.0	3.0	6.0
2N6544		8.0	125	650	300	7.0	35	5.0	1.5	8.0	6.0
2N6545		8.0	125	850	400	7.0	35	5.0	1.5	5.0	6.0
2N6546		15	175	650	300	12	60	5.0	1.5	10	6.0
2N6547		15	175	850	400	12	60	5.0	1.5	10	6.0
2N6569	2N6594	12	100	45	40	15	200	4.0	1.5	4.0	2.5
2N6576		15	120	60	60	2,000	20,000	4.0	4.0	15	6.0
2N6577		15	120	90	90	2,000	20,000	4.0	4.0	15	6.0
2N6578		15	120	120	120	2,000	20,000	4.0	4.0	15	6.0
2N6671		8.0	150	350	300	10	40	---	2.0	8.0	15
2N6672		8.0	150	400	350	10	40	---	2.0	8.0	15
2N6673		8.0	150	450	400	10	40	---	2.0	8.0	15

Shaded areas indicate Darlington.

Power Transistors

TO-3 Case (Continued)

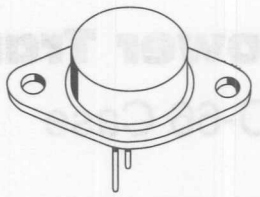


TYPE NO.		I_C	P_D	BV_{CBO}	BV_{CEO}	h_{FE} *TYP		@ I_C	$V_{CE(SAT)}$ @ I_C		f_T *TYP
NPN	PNP	(A) MAX	(W)	(V) MIN	(V) MIN	MIN	MAX	(A)	(V) MAX	(A)	(MHZ) MIN
2N6674		15	175	350	300	8.0	20	---	5.0	15	15
2N6675		15	175	450	400	8.0	20	---	5.0	15	15
BDW51	BDW52	15	125	45	45	20	150	5.0	3.0	10	3.0
BDW51A	BDW52A	15	125	60	60	20	150	5.0	3.0	10	3.0
BDW51B	BDW52B	15	125	80	80	20	150	5.0	3.0	10	3.0
BDW51C	BDW52C	15	125	100	100	20	150	5.0	3.0	10	3.0
BDX85	BDX86	10	100	45	45	750	18,000	4.0	4.0	8.0	10*
BDX85A	BDX86A	10	100	60	60	750	18,000	4.0	4.0	8.0	10*
BDX85B	BDX86B	10	100	80	80	750	18,000	4.0	4.0	8.0	10*
BDX85C	BDX86C	10	100	100	100	750	18,000	4.0	4.0	8.0	10*
BDX87	BDX88	12	120	40	40	750	18,000	6.0	3.0	12	20*
BDX87A	BDX88A	12	120	60	60	750	18,000	6.0	3.0	12	20*
BDX87B	BDX88B	12	120	80	80	750	18,000	6.0	3.0	12	20*
BDX87C	BDX88C	12	120	100	100	750	18,000	6.0	3.0	12	20*
BDY90		10	60	120	100	30	120	5.0	1.5	10	70*
BDY91		10	60	100	80	30	120	5.0	1.5	10	70*
BDY92		10	60	80	60	30	120	5.0	1.0	10	70*
BU208		8.0	150	1,500	700	---	---	---	5.0	4.5	7.0*
BU208A		8.0	150	1,500	700	---	---	---	1.0	4.5	7.0*
BUW34		10	125	500	400	---	---	---	1.5	5.0	---
BUW35		10	125	800	400	---	---	---	1.5	5.0	---
BUW36		10	125	900	450	---	---	---	1.5	5.0	---
BUW44		15	175	500	400	---	---	---	3.0	10	---
BUW45		15	175	800	400	---	---	---	1.5	10	---
BUW46		15	175	900	450	---	---	---	1.5	10	---
BUX11		20	150	250	200	20	60	6.0	1.5	12	8.0
BUX43		10	120	400	325	15	60	3.0	1.6	5.0	8.0
BUX44		8.0	120	450	400	15	45	2.0	2.0	4.0	8.0
BUX47		9.0	125	850	400	---	---	---	3.0	9.0	---
BUX48		15	175	850	400	---	---	---	5.0	15	---
BUX80		10	100	800	400	30*	---	1.2	3.0	8.0	---
BUY69A		10	100	1,000	400	15	---	2.5	3.3	8.0	10*
BUY69B		10	100	800	325	15	---	2.5	3.3	8.0	10*

Shaded areas indicate Darlington.

Power Transistors

TO-3 Case (Continued)

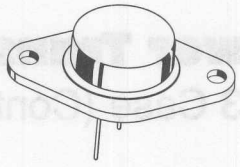


TYPE NO.		I_C	P_D	BV_{CBO}	BV_{CEO}	h_{FE} *TYP		@ I_C	$V_{CE(SAT)}$ @ I_C		f_T *TYP
		(A)	(W)	(V)	(V)			(A)	(V)	(A)	(MHZ)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
BUY69C		10	100	500	200	15	---	2.5	3.3	8.0	10*
MJ802	MJ4502	30	200	100	90	25	100	7.5	0.8	7.5	2.0
MJ1000	MJ 900	8.0	90	60	60	1,000	---	3.0	4.0	8.0	6.0
MJ1001	MJ 901	8.0	90	80	80	1,000	---	3.0	4.0	8.0	6.0
MJ3000	MJ2500	10	150	60	60	1,000	---	5.0	4.0	10	---
MJ3001	MJ2501	10	150	80	80	1,000	---	5.0	4.0	10	---
MJ4033	MJ4030	16	150	60	60	1,000	---	10	4.0	16	---
MJ4034	MJ4031	16	150	80	80	1,000	---	10	4.0	16	---
MJ4035	MJ4032	16	150	100	100	1,000	---	10	4.0	16	---
MJ10012		10	175	600	400	100	2,000	6.0	2.5	10	---
MJ11012	MJ11011	30	200	60	60	1,000	---	20	4.0	30	4.0
MJ11014	MJ11013	30	200	90	90	1,000	---	20	4.0	30	4.0
MJ11016	MJ11015	30	200	120	120	1,000	---	20	4.0	30	4.0
PMD10K40	PMD11K40	12	150	40	40	800	20,000	6.0	2.0	12	4.0
PMD10K60	PMD11K60	12	150	60	60	800	20,000	6.0	2.0	6.0	4.0
PMD10K80	PMD11K80	12	150	80	80	800	20,000	6.0	2.0	6.0	4.0
PMD10K100	PMD11K100	12	150	100	100	800	20,000	6.0	2.0	6.0	4.0
PMD12K40	PMD13K40	8.0	100	40	40	800	20,000	4.0	2.0	4.0	4.0
PMD12K60	PMD13K60	8.0	100	60	60	800	20,000	4.0	2.0	4.0	4.0
PMD12K80	PMD13K80	8.0	100	80	80	800	20,000	4.0	2.0	4.0	4.0
PMD12K100	PMD13K100	8.0	100	100	100	800	20,000	4.0	2.0	4.0	4.0
PMD1601K	PMD1701K	20	180	60	60	750	20,000	10	2.0	10	4.0
PMD1602K	PMD1702K	20	180	80	80	750	20,000	10	2.0	10	4.0
PMD1603K	PMD1703K	20	180	100	100	750	20,000	10	2.0	10	4.0
PMD16K60	PMD17K60	20	200	60	60	800	20,000	10	2.0	10	4.0
PMD16K80	PMD17K80	20	200	80	80	800	20,000	10	2.0	10	4.0
PMD16K100	PMD17K100	20	200	100	100	800	20,000	10	2.0	10	4.0
PMD18K60	PMD19K60	30	225	60	60	800	20,000	15	2.0	15	4.0
PMD18K80	PMD19K80	30	225	80	80	800	20,000	15	2.0	15	4.0
PMD18K100	PMD19K100	30	225	100	100	800	20,000	15	2.0	15	4.0
SE9303	SE9403	10	100	60	60	1,000	---	7.5	2.5	7.5	1.0
SE9304	SE9404	10	100	80	80	1,000	---	7.5	2.5	7.5	1.0
SE9305	SE9405	10	100	100	100	1,000	---	7.5	2.5	7.5	1.0

Shaded areas indicate Darlington.

Power Transistors

TO-66 Case



TYPE NO.		I_C (A)	P_D (W)	BV_{CBO} (V)	BV_{CEO} (V)	h_{FE}		@ I_C (A)	$V_{CE(SAT)}$ (V)	@ I_C (A)	f_T (MHz)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
2N3054		4.0	25	90	55	25	150	0.5	1.0	0.5	0.8
2N3054A	2N6049	4.0	75	90	55	25	150	0.5	0.5	0.5	0.8
2N3583	2N6420	2.0	35	250	175	40	---	0.1	5.0	1.0	10
2N3584	2N6421	2.0	35	375	250	40	---	0.1	0.75	1.0	10
2N3585	2N6422	2.0	35	500	300	40	---	0.1	0.75	1.0	10
2N3738		1.0	20	250	225	40	200	0.1	2.5	0.25	10
2N3739		1.0	20	325	300	40	200	0.1	2.5	0.25	10
	2N3740	4.0	25	60	60	30	150	0.25	0.6	1.0	3.0
	2N3740A	4.0	25	60	60	30	150	0.25	0.6	1.0	3.0
	2N3741	4.0	25	80	80	30	150	0.25	0.6	1.0	3.0
	2N3741A	4.0	25	80	80	30	150	0.25	0.6	1.0	3.0
2N3766		4.0	20	80	60	40	160	0.5	1.0	0.5	10
2N3767		4.0	20	100	80	40	160	0.5	1.0	0.5	10
2N4231		3.0	35	50	40	25	100	1.5	2.0	3.0	4.0
2N4231A	2N6312	5.0	75	40	40	25	100	1.5	4.0	5.0	4.0
2N4232		3.0	35	70	60	25	100	1.5	2.0	3.0	4.0
2N4232A	2N6313	5.0	75	60	60	25	100	1.5	4.0	5.0	4.0
2N4233		3.0	35	90	80	25	100	1.5	2.0	3.0	4.0
2N4233A	2N6314	5.0	75	80	80	25	100	1.5	4.0	5.0	4.0
2N4240	2N6423	2.0	35	500	300	40	---	0.1	1.0	0.75	15
2N4296		1.0	20	350	250	50	150	0.05	0.9	0.05	20
2N4298		1.0	20	500	350	25	75	0.05	0.9	0.05	20
2N4299		1.0	20	500	350	50	150	0.05	0.75	0.05	20
2N4910	2N4898	1.0	25	40	40	20	150	0.5	0.6	1.0	3.0
2N4911	2N4899	1.0	25	60	60	20	150	0.5	0.6	1.0	3.0
2N4912	2N4900	1.0	25	80	80	20	150	0.5	0.6	1.0	3.0
2N5427		7.0	40	80	80	30	120	2.0	0.7	2.0	30
2N5428		7.0	40	80	80	60	240	2.0	0.7	2.0	30
2N5429		7.0	40	100	100	30	120	2.0	0.7	2.0	30
2N5430		7.0	40	100	100	60	240	2.0	0.7	2.0	30
	2N6211	1.0	35	275	225	10	100	1.0	1.4	0.125	20
	2N6212	1.0	35	350	300	10	100	1.0	1.6	0.125	20
	2N6213	1.0	35	400	350	10	100	1.0	2.0	0.125	20
2N6260		4.0	29	50	40	20	100	1.5	1.5	1.5	0.8
2N6261		4.0	50	90	80	25	100	1.5	0.5	1.5	0.8
2N6263		3.0	20	140	120	20	150	0.5	1.2	0.5	0.8
2N6294	2N6296	4.0	50	60	60	750	18,000	2.0	2.0	2.0	4.0
2N6295	2N6297	4.0	50	80	80	750	18,000	2.0	2.0	2.0	4.0
2N6300	2N6298	8.0	75	60	60	750	18,000	4.0	2.0	4.0	4.0
2N6301	2N6299	8.0	75	80	80	750	18,000	4.0	2.0	4.0	4.0
2N6315	2N6317	7.0	90	60	60	20	100	2.5	1.0	4.0	4.0
2N6316	2N6318	7.0	90	80	80	20	100	2.5	1.0	4.0	4.0
2N6372	2N5954	6.0	40	90	80	20	100	2.0	1.0	2.0	4.0
2N6373	2N5955	6.0	40	70	60	20	100	2.5	1.0	2.5	4.0
2N6374	2N5956	6.0	40	50	40	20	100	3.0	1.0	3.0	4.0
	2N6424	1.0	20	250	225	40	200	0.1	2.5	0.25	10
	2N6425	1.0	20	325	300	40	200	0.1	2.5	0.25	10
2N6465	2N6467	4.0	40	110	100	15	150	1.5	1.2	1.5	5.0
2N6466	2N6468	4.0	40	130	120	15	150	1.5	1.2	1.5	5.0
40312		4.0	29	60	60	20	120	1.0	1.0	0.5	0.75
CM3441		3.0	25	160	120	25	150	0.5	1.0	0.5	0.2

Shaded areas indicate Darlington.

Power Transistors

TO-126 Case

Top View

Bottom View

TYPE NO.		IC	PD	BVCBO	BVCEO	hFE		@ IC	VCE(SAT) @ IC		fT
		(A)	(W)	(V)	(V)			(mA)	(V)	(A)	(MHz)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
2N4921	2N4918	1.0	30	40	40	30	150	500	0.6	1.0	3.0
2N4922	2N4919	1.0	30	60	60	30	150	500	0.6	1.0	3.0
2N4923	2N4920	1.0	30	80	80	30	150	500	0.6	1.0	3.0
2N5190	2N5193	4.0	40	40	40	25	100	1,500	0.6	1.5	2.0
2N5191	2N5194	4.0	40	60	60	25	100	1,500	0.6	1.5	2.0
2N5192	2N5195	4.0	40	80	80	20	80	1,500	0.6	1.5	2.0
2N5655		0.5	20	275	250	30	250	100	1.0	0.1	10
2N5656		0.5	20	325	300	30	250	100	1.0	0.1	10
2N5657		0.5	20	375	350	30	250	100	1.0	0.1	10
2N6037	2N6034	4.0	40	40	40	750	15,000	2,000	2.0	2.0	25
2N6038	2N6035	4.0	40	60	60	750	15,000	2,000	2.0	2.0	25
2N6039	2N6036	4.0	40	80	80	750	15,000	2,000	2.0	2.0	25
BD135	BD136	1.5	12.5	45	45	40	250	150	0.5	0.5	---
BD137	BD138	1.5	12.5	60	60	40	250	150	0.5	0.5	---
BD139	BD140	1.5	12.5	80	80	40	250	150	0.5	0.5	---
BD175	BD176	3.0	30	45	45	40	---	150	0.8	1.0	3.0
BD177	BD178	3.0	30	60	60	40	---	150	0.8	1.0	3.0
BD179	BD180	3.0	30	80	80	40	---	150	0.8	1.0	3.0
BD233	BD234	2.0	25	45	45	40	---	150	0.6	1.0	3.0
BD235	BD236	2.0	25	60	60	40	---	150	0.6	1.0	3.0
BD237	BD238	2.0	25	80	80	40	---	150	0.6	1.0	3.0
BD433	BD434	4.0	36	22	22	40	---	10	0.5	2.0	3.0
BD435	BD436	4.0	36	32	32	40	---	10	0.5	2.0	3.0
BD437	BD438	4.0	36	45	45	30	---	10	0.6	2.0	3.0
BD439	BD440	4.0	36	60	60	20	---	10	0.8	2.0	3.0
BD441	BD442	4.0	36	80	80	15	---	10	0.8	2.0	3.0
BD675	BD676	4.0	40	45	45	750	---	1.5	2.5	1.5	1.0
BD675A	BD676A	4.0	40	45	45	750	---	2.0	2.8	2.0	1.0
BD677	BD678	4.0	40	60	60	750	---	1.5	2.5	1.5	1.0
BD677A	BD678A	4.0	40	60	60	750	---	2.0	2.8	2.0	1.0
BD679	BD680	4.0	40	80	80	750	---	1.5	2.5	1.5	1.0
BD679A	BD680A	4.0	40	80	80	750	---	2.0	2.8	2.0	1.0
BD681	BD682	4.0	40	100	100	750	---	1.5	2.5	1.5	1.0

Shaded areas indicate Darlington.

Power Transistors

TO-126 Case (Continued)

Top View

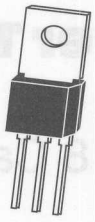
Bottom View

TYPE NO.		I_C (A)	P_D (W)	BV_{CBO} (V)	BV_{CEO} (V)	h_{FE}		@ I_C (mA)	$V_{CE(SAT)}$ (V)	@ I_C (A)	f_T (MHz)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
MJE180	MJE170	3.0	15	60	40	50	250	100	0.3	0.5	50
MJE181	MJE171	3.0	15	80	60	50	250	100	0.3	0.5	50
MJE182	MJE172	3.0	15	100	80	50	250	100	0.3	0.5	50
MJE200	MJE210	5.0	15	40	25	45	180	2,000	0.3	0.5	65
MJE220	MJE230	4.0	15	60	40	40	200	200	0.3	0.5	50
MJE221	MJE231	4.0	15	60	40	40	150	200	0.3	0.5	50
MJE222	MJE232	4.0	15	60	40	25	---	200	0.3	0.5	50
MJE223	MJE233	4.0	15	80	60	40	200	200	0.3	0.5	50
MJE224	MJE234	4.0	15	80	60	40	150	200	0.3	0.5	50
MJE225	MJE235	4.0	15	80	60	25	---	200	0.3	0.5	50
MJE240	MJE250	4.0	15	80	80	40	200	200	0.3	0.5	40
MJE241	MJE251	4.0	15	80	80	40	120	200	0.3	0.5	40
MJE242	MJE252	4.0	15	80	80	25	---	200	0.3	0.5	40
MJE243	MJE253	4.0	15	100	100	40	120	200	0.3	0.5	40
MJE244	MJE254	4.0	15	100	100	25	---	200	0.3	0.5	40
MJE340	MJE350	0.5	20	300	300	30	240	50	---	---	---
MJE341		0.5	20	175	150	25	200	50	2.3	0.15	15
MJE344		0.5	20	200	200	30	300	50	1.0	0.05	15
MJE520	MJE370	3.0	25	30	30	25	---	1,000	---	---	---
MJE521	MJE371	4.0	40	40	40	40	---	1,000	---	---	---
MJE720	MJE710	1.5	20	40	40	40	---	150	1.0	1.5	---
MJE721	MJE711	1.5	20	60	60	40	---	150	1.0	1.5	---
MJE722	MJE712	1.5	20	80	80	40	---	150	1.0	1.5	---
MJE800	MJE700	4.0	40	60	60	750	---	1,500	2.5	1.5	1.0
MJE801	MJE701	4.0	40	60	60	750	---	2,000	2.8	2.0	1.0
MJE802	MJE702	4.0	40	80	80	750	---	1,500	2.5	1.5	1.0
MJE803	MJE703	4.0	40	80	80	750	---	2,000	2.8	2.0	1.0
MJE3439		0.3	15	450	350	50	200	20	0.5	0.1	15
MJE3440		0.3	15	350	250	50	200	20	0.5	0.1	15

Shaded areas indicate Darlington.

Power Transistors

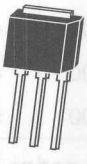
TO-202 Case



TYPE NO.		I_C	P_D	BV_{CBO}	BV_{CEO}	h_{FE}		@ I_C	$V_{CE(SAT)}$	@ I_C	f_T
		(A)	(W)	(V)	(V)			(mA)	(V)	(A)	(MHz)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
2N6548		2.0	2.0	50	40	25,000	150,000	200	2.0	2.0	100
2N6549		2.0	2.0	50	40	15,000	150,000	200	2.0	2.0	100
2N6551	2N6554	1.0	2.0	60	60	80	300	50	1.0	1.0	75
2N6552	2N6555	1.0	2.0	80	80	80	300	50	1.0	1.0	75
2N6553	2N6556	1.0	2.0	100	100	80	300	50	1.0	1.0	75
CEN-U05	CEN-U55	2.0	1.75	60	60	20	---	500	0.5	0.25	50
CEN-U06	CEN-U56	2.0	1.75	80	80	20	---	500	0.5	0.25	50
CEN-U07	CEN-U57	2.0	1.75	100	100	20	---	500	0.5	0.25	50
CEN-U45		2.0	1.75	50	40	25,000	150,000	200	1.0	0.20	100

Shaded areas indicate Darlington.

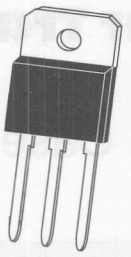
TO-202 devices are available with sheared tab (Case: TO-202-2).
Add "N" suffix to part number.



TO-202-2 Case

Power Transistors

TO-218 Case*

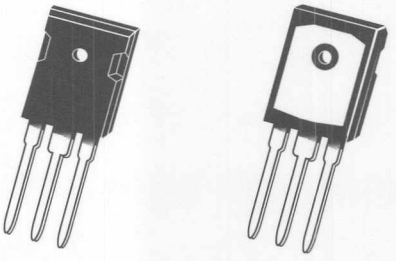


NPN High Voltage Switching

TYPE NO.	I_C (A)	P_D (W)	BV_{CBO} (V) MIN	BV_{CEO} (V) MIN	$V_{CE(SAT)}$ (V) MAX	@ I_C (A)	@ I_B (mA)	t_{off} (µs) †TYP MAX	f_T (MHz) †TYP MIN
2N6931**	10	150	350	300	1.0	10	2,000	3.0	---
2N6932**	10	150	450	400	1.0	10	2,000	3.0	---
2N6933**	15	175	450	300	1.0	15	3,000	3.0	---
2N6934**	15	175	550	350	1.0	15	3,000	3.0	---
2N6935**	15	175	650	400	1.0	15	3,000	3.0	---
BU426**	6.0	115	800	375	1.5	2.5	500	4.0	---
BU426A**	6.0	115	900	400	1.5	2.5	500	4.0	---
BU508**	8.0	125	1,000	700	5.0	4.5	2,000	---	7.0†
BU508A**	8.0	125	1,500	700	1.0	4.5	2,000	---	7.0†
BU508D**	8.0	125	1,500	700	1.0	4.5	2,000	---	7.0†
BUV47**	9.0	100	850	400	1.5	6.0	1,200	3.3	---
BUV47A**	9.0	100	1,000	450	1.5	5.0	1,000	3.8	---
BUV48**	15	125	850	400	1.5	10	2,000	3.8	---
BUV48A**	15	125	1,000	450	1.5	8.0	1,600	3.5	---
TIP51**	3.0	100	350	250	1.5	3.0	600	2.0†	2.5
TIP52**	3.0	100	400	300	1.5	3.0	600	2.0†	2.5
TIP53**	3.0	100	450	350	1.5	3.0	600	2.0†	2.5
TIP54**	3.0	100	500	400	1.5	3.0	600	2.0†	2.5

** Available on special order only; please consult factory.

* Devices are also available in TO-247 Case (isolated mounting hole) on special order.

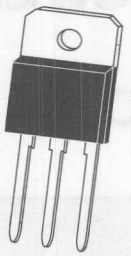


Top View Bottom View

TO-247 Case

Power Transistors

TO-218 Case* (Continued)

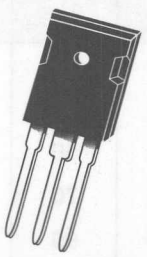


General Purpose Amplifier

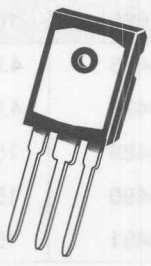
TYPE NO.		I_C (A)	P_D (W)	BV_{CBO} (V)	BV_{CEO} (V)	h_{FE}		@ I_C (A)	@ V_{CE} (V)	$V_{CE(SAT)}$ (V)	@ I_C (A)	f_T (MHz) **TYP
NPN	PNP			MIN	MIN	MIN	MAX			MAX		MIN
BDV65	BDV64	12	125	60	60	1,000	---	5.0	4.0	2.0	5.0	60**
BDV65A	BDV64A	12	125	80	80	1,000	---	5.0	4.0	2.0	5.0	60**
BDV65B	BDV64B	12	125	100	100	1,000	---	5.0	4.0	2.0	5.0	60**
BDW83A	BDW84A	15	130	60	60	750	20,000	6.0	3.0	2.5	6.0	---
BDW83B	BDW84B	15	130	80	80	750	20,000	6.0	3.0	2.5	6.0	---
BDW83C	BDW84C	15	130	100	100	750	20,000	6.0	3.0	2.5	6.0	---
TIP33A	TIP34A	10	80	60	60	20	100	3.0	4.0	1.0	3.0	3.0
TIP33B	TIP34B	10	80	80	80	20	100	3.0	4.0	1.0	3.0	3.0
TIP33C	TIP34C	10	80	100	100	20	100	3.0	4.0	1.0	3.0	3.0
TIP35A	TIP36A	25	125	60	60	10	75	15	4.0	1.8	15	3.0
TIP35B	TIP36B	25	125	80	80	10	75	15	4.0	1.8	15	3.0
TIP35C	TIP36C	25	125	100	100	10	75	15	4.0	1.8	15	3.0
TIP140	TIP145	10	125	60	60	1,000	---	5.0	4.0	3.0	10	---
TIP141	TIP146	10	125	80	80	1,000	---	5.0	4.0	3.0	10	---
TIP142	TIP147	10	125	100	100	1,000	---	5.0	4.0	3.0	10	---
TIP3055	TIP2955	15	90	100	60	20	100	4.0	4.0	1.1	4.0	3.0

Shaded areas indicate Darlington.

* Devices are also available in TO-247 Case (isolated mounting hole) on special order.



Top View

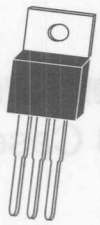


Bottom View

TO-247 Case

Power Transistors

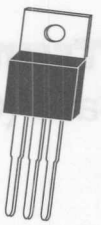
TO-220 Case



TYPE NO.		I_C (A)	P_D (W)	BV_{CBO} (V)	BV_{CEO} (V)	h_{FE}		@ I_C (A)	$V_{CE(SAT)}$ (V)	@ I_C (A)	f_T (MHz)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
2N5294		4.0	36	80	70	30	120	0.5	1.0	0.5	0.8
2N5296		4.0	36	60	40	30	120	1.0	1.0	1.0	0.8
2N5298		4.0	36	80	60	20	80	1.5	1.0	1.5	0.8
2N5490		7.0	50	60	40	20	100	2.0	1.0	2.0	0.8
2N5492		7.0	50	75	55	20	100	2.5	1.0	2.5	0.8
2N5494		7.0	50	60	40	20	100	3.0	1.0	3.0	0.8
2N5496		7.0	50	90	70	20	100	3.5	1.0	35	0.8
2N6043	2N6040	10	75	60	60	1,000	20,000	4.0	2.0	4.0	4.0
2N6044	2N6041	10	75	80	80	1,000	20,000	4.0	2.0	4.0	4.0
2N6045	2N6042	10	75	100	100	1,000	20,000	3.0	2.0	3.0	4.0
2N6099		10	75	70	60	20	80	4.0	2.5	10	5.0
2N6101		10	75	80	70	20	80	5.0	2.5	10	5.0
2N6103		16	75	45	40	15	80	8.0	2.5	16	5.0
2N6121	2N6124	4.0	40	45	45	25	100	1.5	0.6	1.5	2.5
2N6122	2N6125	4.0	40	60	60	25	100	1.5	0.6	1.5	2.5
2N6123	2N6126	4.0	40	80	80	20	80	1.5	0.6	1.5	2.5
2N6129	2N6132	7.0	50	40	40	20	100	2.5	1.4	7.0	2.5
2N6130	2N6133	7.0	50	60	60	20	100	2.5	1.4	7.0	2.5
2N6131	2N6134	7.0	50	80	80	20	100	2.5	1.8	7.0	2.5
2N6288	2N6111	7.0	40	40	30	30	150	2.0	3.5	7.0	4.0
2N6290	2N6109	7.0	40	60	50	30	150	2.5	3.5	7.0	4.0
2N6292	2N6107	7.0	40	80	70	30	150	3.0	3.5	7.0	4.0
2N6386	2N6666	8.0	65	40	40	1,000	20,000	3.0	2.0	3.0	20
2N6387	2N6667	10	65	60	60	1,000	20,000	5.0	2.0	5.0	20
2N6388	2N6668	10	65	80	80	1,000	20,000	5.0	2.0	5.0	20
2N6473	2N6475	4.0	40	110	100	15	150	1.5	1.2	1.5	4.0
2N6474	2N6476	4.0	40	130	120	15	150	1.5	1.2	1.5	4.0
2N6486	2N6489	15	75	50	40	20	150	5.0	1.3	5.0	5.0
2N6487	2N6490	15	75	70	60	20	150	5.0	1.3	5.0	5.0
2N6488	2N6491	15	75	90	80	20	150	5.0	1.3	5.0	5.0

Shaded areas indicate Darlington.

Power Transistors
TO-220 Case (Continued)

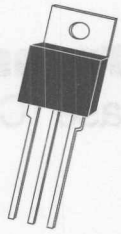


TYPE NO.		I_C	P_D	BV_{CBO}	BV_{CEO}	h_{FE}		@ I_C	$V_{CE(SAT)}$	@ I_C	f_T
		(A)	(W)	(V)	(V)			(A)	(V)	(A)	(MHz)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
2N6497		5.0	80	350	250	10	75	2.5	5.0	5.0	5.0
2N6498		5.0	80	400	300	10	75	2.5	5.0	5.0	5.0
2N6499		5.0	80	450	350	10	75	2.5	5.0	5.0	5.0
2N6530		8.0	65	80	80	1,000	10,000	5.0	3.0	8.0	20
2N6531		8.0	65	100	100	500	10,000	3.0	3.0	8.0	20
2N6532		8.0	65	100	100	1,000	10,000	5.0	3.0	8.0	20
2N6533		8.0	65	120	120	1,000	10,000	3.0	3.0	8.0	20
BU406		7.0	60	400	200	---	---	---	1.0	5.0	10
BU406D		7.0	60	400	200	---	---	---	1.0	5.0	10
BU407		7.0	60	330	150	---	---	---	1.0	5.0	10
BU407D		7.0	60	330	150	---	---	---	1.0	5.0	10
BU408		7.0	60	400	200	---	---	---	1.0	6.0	10
BU408D		7.0	60	400	200	---	---	---	1.0	6.0	10
BU806		8.0	60	400	200	---	---	---	1.5	5.0	---
BU807		8.0	60	330	150	---	---	---	1.5	5.0	---
D44H11	D45H11	10	50	80	80	40	---	1.0	1.0	8.0	40
MJE800T	MJE700T	4.0	50	60	60	750	---	1.5	2.5	1.5	1.0
MJE801T	MJE701T	4.0	50	60	60	750	---	2.0	2.8	2.0	1.0
MJE802T	MJE702T	4.0	50	80	80	750	---	1.5	2.5	1.5	1.0
MJE803T	MJE703T	4.0	50	80	80	750	---	2.0	2.8	2.0	1.0
MJE2801T	MJE2901T	10	75	60	60	25	100	3.0	---	---	---
MJE3055T	MJE2955T	10	75	70	60	20	100	4.0	1.1	4.0	2.0
MJE13004		4.0	75	600	300	8.0	40	2.0	0.5	1.0	4.0
MJE13005		4.0	75	700	400	8.0	40	2.0	0.5	1.0	4.0
MJE13006		8.0	80	600	300	5.0	30	5.0	1.0	2.0	4.0
MJE13007		8.0	80	700	400	5.0	30	5.0	1.0	2.0	4.0
MJE13007A		8.0	80	850	400	5.0	30	5.0	3.0	8.0	4.0
MJE13008		12	100	600	300	6.0	30	8.0	1.0	5.0	4.0
MJE13009		12	100	700	400	6.0	30	8.0	1.0	5.0	4.0

Shaded areas indicate Darlington.

Power Transistors

TO-220 Case (Continued)



TYPE NO.		I_C	P_D	BV_{CBO}	BV_{CEO}	h_{FE}		@ I_C	$V_{CE(SAT)}$	@ I_C	f_T
		(A)	(W)	(V)	(V)			(A)	(V)	(A)	(MHz)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
SE9300	SE9400	10	70	60	60	1,000	---	4.0	2.0	4.0	1.0
SE9301	SE9401	10	70	80	80	1,000	---	4.0	2.0	4.0	1.0
SE9302	SE9402	10	70	100	100	1,000	---	4.0	2.0	4.0	1.0
TIP29	TIP30	1.0	30	40	40	15	75	1.0	0.7	1.0	3.0
TIP29A	TIP30A	1.0	30	60	60	15	75	1.0	0.7	1.0	3.0
TIP29B	TIP30B	1.0	30	80	80	15	75	1.0	0.7	1.0	3.0
TIP29C	TIP30C	1.0	30	100	100	15	75	1.0	0.7	1.0	3.0
TIP31	TIP32	3.0	40	40	40	10	50	3.0	1.2	3.0	3.0
TIP31A	TIP32A	3.0	40	60	60	10	50	3.0	1.2	3.0	3.0
TIP31B	TIP32B	3.0	40	80	80	10	50	3.0	1.2	3.0	3.0
TIP31C	TIP32C	3.0	40	100	100	10	50	3.0	1.2	3.0	3.0
TIP41	TIP42	6.0	65	40	40	15	75	3.0	1.5	6.0	3.0
TIP41A	TIP42A	6.0	65	60	60	15	75	3.0	1.5	6.0	3.0
TIP41B	TIP42B	6.0	65	80	80	15	75	3.0	1.5	6.0	3.0
TIP41C	TIP42C	6.0	65	100	100	15	75	3.0	1.5	6.0	3.0
TIP47		1.0	40	350	250	30	150	0.3	1.0	1.0	10
TIP48		1.0	40	400	300	30	150	0.3	1.0	1.0	10
TIP49		1.0	40	450	350	30	150	0.3	1.0	1.0	10
TIP50		1.0	40	500	400	30	150	0.3	1.0	1.0	10
TIP100	TIP105	8.0	80	60	60	1,000	20,000	3.0	2.0	3.0	4.0
TIP101	TIP106	8.0	80	80	80	1,000	20,000	3.0	2.0	3.0	4.0
TIP102	TIP107	8.0	80	100	100	1,000	20,000	3.0	2.0	3.0	4.0
TIP110	TIP115	2.0	50	60	60	500	---	2.0	2.5	2.0	25
TIP111	TIP116	2.0	50	80	80	500	---	2.0	2.5	2.0	25
TIP112	TIP117	2.0	50	100	100	500	---	2.0	2.5	2.0	25
TIP120	TIP125	5.0	65	60	60	1,000	---	3.0	2.0	3.0	4.0
TIP121	TIP126	5.0	65	80	80	1,000	---	3.0	2.0	3.0	4.0
TIP122	TIP127	5.0	65	100	100	1,000	---	3.0	2.0	3.0	4.0
TIP130	TIP135	8.0	70	60	60	1,000	15,000	4.0	2.0	4.0	---
TIP131	TIP136	8.0	70	80	80	1,000	15,000	4.0	2.0	4.0	---
TIP132	TIP137	8.0	70	100	100	1,000	15,000	4.0	2.0	4.0	---

Shaded areas indicate Darlington.

Power Transistors

TO-237 Case

TYPE NO.		I_C	P_D	BV_{CBO}	BV_{CEO} *BV_{CES}	h_{FE}		@ I_C	$V_{CE(SAT)}$	@ I_C	f_T
		(A)	(W)	(V)	(V)			(mA)	(V)	(mA)	(MHz)
NPN	PNP	MAX		MIN	MIN	MIN	MAX		MAX		MIN
2N6714	2N6726	2.0	2.0	40	30	50	250	1,000	0.5	1,000	50
2N6715	2N6727	2.0	2.0	50	40	50	250	1,000	0.5	1,000	50
2N6716	2N6728	2.0	2.0	60	60	50	250	250	0.35	250	50
2N6717	2N6729	2.0	2.0	80	80	50	250	250	0.35	250	50
2N6718	2N6730	2.0	2.0	100	100	50	250	250	0.35	250	50
2N6719		0.5	2.0	300	300	40	200	30	---	---	30
2N6720		1.0	2.0	175	150	10	50	500	0.5	100	30
2N6721		1.0	2.0	225	200	10	50	500	0.5	100	30
2N6722		1.0	2.0	275	250	10	50	500	0.5	100	30
2N6723		1.0	2.0	325	300	10	50	500	0.5	100	30
2N6724		1.5	2.0	50	40	4,000	40,000	1,000	1.0	200	1.0
2N6725		1.5	2.0	60	50	4,000	40,000	1,000	1.0	200	1.0
2N6731	2N6732	1.0	2.0	100	80	100	300	350	0.35	350	50
2N6733		0.5	2.0	200	200	40	200	10	2.0	20	50
2N6734		0.5	2.0	250	250	40	200	10	2.0	20	50
2N6735		0.5	2.0	300	300	40	200	10	2.0	20	50
2N6737**		1.5	2.0	80	45	35	---	500	0.52	500	300
CENW01	CENW51	1.0	2.5	40	30	60	---	100	0.7	1,000	50
CENW01A	CENW51A	1.0	2.5	50	40	60	---	100	0.7	1,000	50
CENW05	CENW55	0.5	2.5	60	60	80	---	50	0.5	250	50
CENW06	CENW56	0.5	2.5	80	80	80	---	50	0.5	250	50
CENW07	CENW57	0.5	2.5	100	100	80	---	50	0.5	250	50
CENW10	CENW60	0.5	2.5	300	300	25	---	30	0.75	20	50
CENW13	CENW63	1.0	2.5	30	30*	10,000	---	100	1.5	100	125
CENW14	CENW64	1.0	2.5	30	30*	20,000	---	100	1.5	100	125
CENW42	CENW92	0.5	2.5	300	300	40	---	10	0.5	20	50
TN2102		1.0	2.0	120	65	40	120	150	0.5	150	60
TN2219A		0.8	2.0	75	40	100	300	150	1.6	500	300
	TN2905A	0.8	2.0	60	60	100	300	150	1.6	500	200
TN3019		1.0	2.0	140	80	100	300	150	0.5	500	100
TN3020		1.0	2.0	140	80	40	120	150	0.5	500	80
TN3053		1.0	2.0	60	40	50	250	150	1.4	150	100
TN3724**		1.5	2.0	50	30	35	---	500	0.42	500	300
TN3725**		1.5	2.0	80	50	35	---	500	0.52	500	300

Shaded areas indicate Darlington.

** Not recommended for new designs.

Junction FETs

Junction FETs*

TO-72

TO-92

RF Amplifiers

N-Channel

CASE	TYPE NO.	Re $\|Y_{fs}\|$ @		Re $\|Y_{os}\|$ @		C_{iss}	C_{rss}	NF @		$V_{(BR)GSS}$	$V_{GS(off)}$		I_{DSS}		PIN OUT
		(mmho)	f	(μmho)	f	(pF)	(pF)	(dB)	RG=1K	(V)	(V)		(mA)		
		MIN	(MHz)	MAX	(MHz)	MAX	MAX	MAX	f (MHz)	MIN	MIN	MAX	MIN	MAX	
TO-92	**2N3819**	1.6	100	---	---	8.0	4.0	---	---	25	---	8.0	2.0	20	DGS
TO-72	**2N4416**	4.0	400	100	400	4.0	0.8	4.0	400	30	---	6.0	5.0	15	SDGC
TO-72	**2N4416A**	4.0	400	100	400	4.0	0.8	4.0	400	35	2.0	6.0	5.0	15	SDGC
TO-92	**2N5484**	2.5	100	75	100	5.0	1.0	3.0	100	25	0.3	3.0	1.0	5.0	DSG
TO-92	**2N5485**	3.0	400	100	400	5.0	1.0	4.0	400	25	0.5	4.0	4.0	10	DSG
TO-92	**2N5486**	3.5	400	100	400	5.0	1.0	4.0	400	25	2.0	6.0	8.0	20	DSG
TO-92	**2N5949**	3.0	100	75	100	6.0	2.0	5.0	100	30	3.0	7.0	12	18	GSD
TO-92	**2N5950**	3.0	100	75	100	6.0	2.0	5.0	100	30	2.5	6.0	10	15	GSD
TO-92	**2N5951**	3.0	100	75	100	6.0	2.0	5.0	100	30	2.0	5.0	7.0	13	GSD
TO-92	**2N5952**	1.0	100	75	100	6.0	2.0	5.0	100	30	1.3	3.5	4.0	8.0	GSD
TO-92	**2N5953**	1.0	100	50	100	6.0	2.0	5.0	100	30	0.8	3.0	2.5	5.0	GSD

* Some JFET types available on special order only; please consult factory.

Junction FETs*
(Continued)


TO-18


TO-92

Switches / Choppers

N-Channel

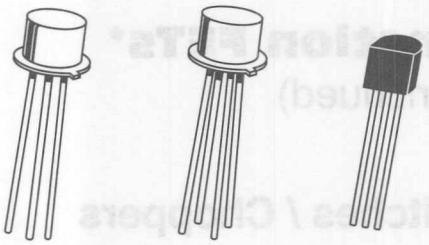
CASE	TYPE NO.	$r_{DS(on)}$ (Ohm)	$V_{GS(off)}$ (V)		I_{DSS} (mA)		$V_{(BR)GSS}$ (V)	C_{iss} (pF)	C_{rss} (pF)	t_{on} (ns)	t_{off} (ns)	PIN OUT
		MAX	MIN	MAX	MIN	MAX	MIN	MAX	MAX	MAX	MAX	
TO-18	**2N4091**	30	5.0	10	30	---	40	16	5.0	25	40	SDG
TO-18	**2N4092**	50	2.0	7.0	15	---	40	16	5.0	35	60	SDG
TO-18	**2N4093**	80	1.0	5.0	8.0	---	40	16	5.0	60	80	SDG
TO-18	**2N4391**	30	4.0	10	50	150	40	14	3.5	15	20	SDG
TO-18	**2N4392**	60	2.0	5.0	25	75	40	14	3.5	15	35	SDG
TO-18	**2N4393**	100	0.5	3.0	5.0	30	40	14	3.5	15	50	SDG
TO-18	**2N4856**	25	4.0	10	50	---	40	10	8.0	9.0	25	SDG
TO-18	**2N4856A**	25	4.0	10	50	---	40	18	4.0	8.0	20	SDG
TO-18	**2N4857**	40	2.0	6.0	20	100	40	18	8.0	10	50	SDG
TO-18	**2N4857A**	40	2.0	6.0	20	100	40	10	3.5	10	40	SDG
TO-18	**2N4858**	60	0.8	4.0	8.0	80	40	18	8.0	20	100	SDG
TO-18	**2N4858A**	60	0.8	4.0	8.0	80	40	10	3.5	16	80	SDG
TO-18	**2N4859**	25	4.0	10	50	---	30	18	8.0	9.0	25	SDG
TO-18	**2N4859A**	25	4.0	10	50	---	30	10	4.0	8.0	20	SDG
TO-18	**2N4860**	40	2.0	6.0	20	100	30	18	8.0	10	50	SDG
TO-18	**2N4860A**	40	2.0	6.0	20	100	30	10	3.5	10	40	SDG
TO-18	**2N4861**	60	0.8	4.0	8.0	80	30	18	8.0	20	100	SDG
TO-18	**2N4861A**	60	0.8	4.0	8.0	80	30	10	3.5	16	80	SDG
TO-92	**2N5555**	150	---	---	15	---	25	5.0	1.2	10	25	DSG
TO-92	**PN4091**	30	5.0	10	30	---	40	16	5.0	25	40	DSG
TO-92	**PN4092**	50	2.0	7.0	15	---	40	16	5.0	35	60	DSG
TO-92	**PN4093**	80	1.0	5.0	8.0	---	40	16	5.0	60	80	DSG
TO-92	**PN4391**	30	4.0	10	50	150	40	14	3.5	15	20	DSG
TO-92	**PN4392**	60	2.0	5.0	25	75	40	14	3.5	15	35	DSG
TO-92	**PN4393**	100	0.5	3.0	5.0	30	40	14	3.5	15	55	DSG

P-Channel

TO-18	**2N5114**	75	5.0	10	30	90	30	25	7.0	16	21	SGD
TO-18	**2N5115**	100	3.0	6.0	15	60	30	25	7.0	30	38	SGD
TO-18	**2N5116**	150	1.0	4.0	5.0	25	30	25	7.0	50	80	SGD

* Some JFET types available on special order only; please consult factory.

Junction FETs*
(Continued)



TO-18 TO-72 TO-92

Low Frequency / Low Noise Amplifiers

N-Channel

CASE	TYPE NO.	G_{fs} (mmho)	G_{oss} (µmho)	C_{iss} (pF)	C_{rss} (pF)	$V_{(BR)GSS}$ (V)	$V_{GS(off)}$ (V)		I_{DSS} (mA)		PIN OUT
		MIN	MAX	MAX	MAX	MIN	MIN	MAX	MIN	MAX	
TO-72	**2N4220**	1.0	10	6.0	2.0	30	---	4.0	0.5	3.0	SDGC
TO-72	**2N4221**	2.0	20	6.0	2.0	30	---	6.0	2.0	6.0	SDGC
TO-72	**2N4222**	2.5	40	6.0	2.0	30	---	8.0	5.0	15.0	SDGC
TO-18	**2N4338**	0.6	5.0	7.0	3.0	50	0.3	1.0	0.2	0.6	SDG
TO-18	**2N4339**	0.8	15	7.0	3.0	50	0.6	1.8	0.5	1.5	SDG
TO-18	**2N4340**	1.3	30	7.0	3.0	50	1.0	3.0	1.2	3.6	SDG
TO-18	**2N4341**	2.0	60	7.0	3.0	50	2.0	6.0	3.0	9.0	SDG
TO-92	**2N5457**	1.0	50	7.0	3.0	25	0.5	6.0	1.0	5.0	DSG
TO-92	**2N5458**	1.5	50	7.0	3.0	25	1.0	7.0	2.0	9.0	DSG
TO-92	**2N5459**	2.0	50	7.0	3.0	25	2.0	8.0	4.0	16	DSG
TO-72	**2N5556**	---	---	6.0	3.0	30	0.2	4.0	0.5	2.5	SDGC
TO-72	**2N5557**	---	---	6.0	3.0	30	0.8	5.0	2.0	5.0	SDGC
TO-92	**PN3685**	1.5	25	4.0	1.2	50	1.0	3.5	1.0	3.0	DSG
TO-92	**PN3686**	1.0	10	4.0	1.2	50	0.6	2.0	0.4	1.2	DSG
TO-92	**PN3687**	0.5	5.0	4.0	1.2	50	0.3	1.2	0.1	0.5	DSG
TO-92	**PN4302**	1.0	50	6.0	3.0	30	---	4.0	0.5	5.0	DSG
TO-92	**PN4303**	2.0	50	6.0	3.0	30	---	6.0	4.0	10	DSG
TO-92	**PN4304**	1.0	50	6.0	3.0	30	---	10	0.5	5.0	DSG

P-Channel

TO-18	**2N2608**	1.0	---	17	---	30	1.0	4.0	0.9	4.5	SGD
TO-18	**2N2609**	2.5	---	30	---	30	1.0	4.0	2.0	10	SGD
TO-92	**2N3820**	0.8	200	32	16	20	---	8.0	0.3	15	DGS
TO-18	**2N5020**	1.0	20	25	7.0	25	0.3	1.5	0.3	1.2	SGD
TO-92	**2N5460**	1.0	75	7.0	2.0	40	0.75	6.0	1.0	5.0	DSG
TO-92	**2N5461**	1.5	75	7.0	2.0	40	1.0	7.5	2.0	9.0	DSG
TO-92	**2N5462**	2.0	75	7.0	2.0	40	1.8	9.0	4.0	16	DSG
TO-92	**PN4360**	2.0	100	20	5.0	20	0.4	10	3.0	30	DSG

* Some JFET types available on special order only; please consult factory.

Silicon Diodes

Silicon Diodes

DO-35 Case

Switching Diodes

TYPE NO.	V_{RRM} (V) MAX	I_O (mA) MAX	V_F (V) MAX	@ I_F (mA)	t_{rr} (ns) MAX	C_T (pF)
1N914	100	150	1.0	10	4.0	4.0
1N914B	100	150	1.0	100	4.0	4.0
1N3062	75	75	1.0	20	2.0	1.0
1N3063	75	75	0.85	10	4.0	2.0
1N3064	75	75	1.0	10	4.0	2.0
1N3065	75	75	1.0	10	4.0	2.0
1N3600	50	200	1.0	200	10	2.5
1N3604	40	150	1.0	50	2.0	2.0
1N3605	75	150	0.88	20	2.0	2.0
1N4148	100	150	1.0	10	4.0	4.0
1N4150	50	200	1.0	200	4.0	2.5
1N4151	75	150	1.0	50	2.0	2.0
1N4152	40	150	0.88	20	2.0	2.0
1N4153	75	150	0.88	20	2.0	2.0
1N4154	35	150	1.0	30	2.0	4.0
1N4444	70	200	1.0	100	7.0	2.0
1N4446	100	150	1.0	20	4.0	4.0
1N4447	100	150	1.0	20	4.0	2.0
1N4448	100	150	1.0	100	4.0	4.0
1N4449	100	150	1.0	30	4.0	2.0
1N4454	75	150	1.0	10	2.0	2.0
1N4863	50	200	1.2	100	7.0	2.0
1N4864	80	200	1.1	100	9.0	1.3

High Voltage Switching Diodes

TYPE NO.	V_{RRM} (V) MAX	I_O (mA) MAX	V_F (V) MAX	@ I_F (mA)	t_{rr} (ns) MAX	C_T (pF)
1N3070	200	200	1.0	100	50	5.0
CSSD2003	250	250	1.0	100	50	5.0

DO-35 devices are also available in Radial Tape and Reel (Euroform). See page 236.

Silicon Diodes

DO-35 Case

Low Leakage Diodes

TYPE NO.	V_{RRM} (V) MAX	I_O (mA) MAX	V_F (V) MAX	@ I_F (mA)	I_R @ V_R (nA) MAX	C_T (pF)
1N457A	70	200	1.0	100	25	6.0
1N459A	200	200	1.0	100	25	6.0
1N485B	200	200	1.0	100	25	1.0
1N3595	150	150	1.0	200	3.0	8.0
CDH300	150	200	1.0	200	1.0	6.0
CDH333	150	200	1.05	200	3.0	6.0

Silicon Diodes

DO-7 Case

General Purpose Diodes

TYPE NO.	V_{RRM} (V) MAX	I_O (mA) MAX	V_F (V) MAX	@ I_F (mA)	t_{rr} (ns) MAX	C_T (pF)
1N645	225	400	1.0	400	200	5.0
1N647	400	400	1.0	400	200	5.0
1N649	600	400	1.0	400	200	5.0

Schottky Diodes

DO-35 Case

TYPE NO.	DESCRIPTION	V_{RRM} (VOLTS) MAX	I_O (mA) MAX	V_F (VOLTS) MAX	@ I_F (mA)	t_{rr} (ns) MAX	C_T (pF)
1N6263	LOW CURRENT	60	15	0.41	1.0	---	2.2
CDSH-2	HIGH CURRENT	20	200	0.3	1.0	5.0	---
CDSH-3	HIGH CURRENT	30	200	0.3	1.0	5	---
CDSH-4	HIGH CURRENT	40	200	0.3	1.0	5	---
CDSH-5	HIGH CURRENT	50	200	0.3	1.0	5.0	---
CDSH270	HIGH CURRENT	100	100	0.45	1.0	---	1.2

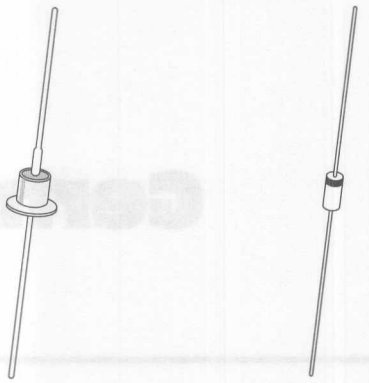
NEW

DO-35 devices are also available in Radial Tape and Reel (Euroform). See page 236.

Germanium Diodes

Germanium Diodes*

DO-1 and DO-7 Cases



DO-1 DO-7

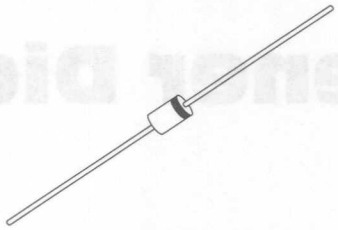
TYPE NO.	CASE	V_{RRM} (V) MAX	I_O (mA) MAX	V_F (V) MAX	@ I_F (mA)	t_{rr} (ns) MAX	TECHNOLOGY
1N34A	DO-7	75	50	1.0	5.0	---	POINT CONTACT
1N60	DO-7	100	50	1.0	5.0	---	POINT CONTACT
1N67A	DO-7	90	50	1.0	5.0	---	POINT CONTACT
1N87A	DO-7	23	50	0.25	1.0	---	POINT CONTACT
1N91	DO-1	100	150	0.45	150	---	GOLD BONDED
1N92	DO-1	200	150	0.45	150	---	GOLD BONDED
1N93	DO-1	300	150	0.45	150	---	GOLD BONDED
1N100A	DO-7	REPLACED BY CDSH270, SEE PAGE 115					
1N191	DO-7	90	50	1.0	5.0	150	POINT CONTACT
1N192	DO-7	70	50	1.0	5.0	500	POINT CONTACT
1N270	DO-7	REPLACED BY CDSH270, SEE PAGE 115					
1N276	DO-7	50	40	1.0	40	300	GOLD BONDED
1N277	DO-7	REPLACED BY CDSH270, SEE PAGE 115					
1N283	DO-7	REPLACED BY CDSH270, SEE PAGE 115					
1N295	DO-7	40	50	1.0	4.0	---	POINT CONTACT
1N3666	DO-7	80	200	1.0	200	300	GOLD BONDED
1N4502	DO-7	REPLACED BY CDSH270, SEE PAGE 115					
CN695	DO-7	REPLACED BY CDSH270, SEE PAGE 115					
CN695A	DO-7	REPLACED BY CDSH270, SEE PAGE 115					

* Not recommended for new designs. See Schottky Diodes on page 115.

Zener Diodes

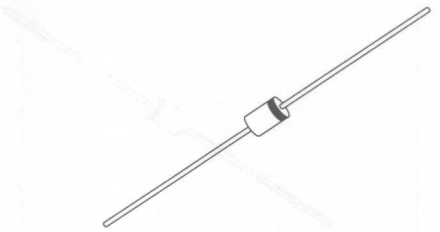
Tight Tolerances of 1% & 2%
and
Special Selections are available.

Zener Diodes

POWER	250 mW			400 mW	
CASE	 DO-35				
ZENER VOLTAGE	GENERAL PURPOSE	LOW NOISE LOW LEVEL	LOW LEVEL	LOW IMPEDANCE	LOW VOLTAGE AVALANCE
1.8		1N4614	1N4678		
2.0		1N4615	1N4679		
2.2		1N4616	1N4680		
2.4		1N4617	1N4681		
2.7	1N702A	1N4618	1N4682		
3.0		1N4619	1N4683		
3.3		1N4620	1N4684	1N3506	
3.6	1N703A	1N4621	1N4685	1N3507	
3.9		1N4622	1N4686	1N3508	
4.3	1N704A	1N4623	1N4687	1N3509	1N6082B
4.7		1N4624	1N4688	1N3510	1N6083B
5.1	1N705A	1N4625	1N4689	1N3511	1N6084B
5.6		1N4626	1N4690	1N3512	1N6085B
6.0	1N706A	1N4627			
6.2		1N4628	1N4691	1N3513	1N6086B
6.8		1N4099	1N4692	1N3514	1N6087B
7.1	1N707A				
7.5		1N4100	1N4693	1N3515	1N6088B
8.2		1N4101	1N4694	1N3516	1N6089B
8.7		1N4102	1N4695		
9.1		1N4103	1N4696	1N3517	1N6090B
10		1N4104	1N4697	1N3518	1N6091B
11		1N4105	1N4698	1N3519	
12		1N4106	1N4699	1N3520	
13		1N4107	1N4700	1N3521	
14		1N4108	1N4701		
15		1N4109	1N4702	1N3522	
16		1N4110	1N4703	1N3523	
17		1N4111	1N4704		
18		1N4112	1N4705	1N3524	
19		1N4113	1N4706		
20		1N4114	1N4707	1N3525	
22		1N4115	1N4708	1N3526	
24		1N4116	1N4709	1N3527	

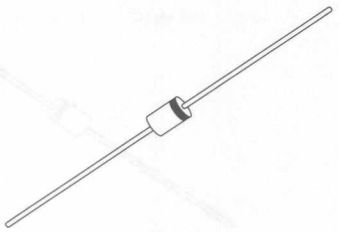
For complete specifications, please consult factory.
Special selections and tight tolerances available.
DO-35 devices are also available in Radial Tape and Reel (Euroform). See page 236.

Zener Diodes (Continued)

POWER	250 mW			400 mW	
CASE	 DO-35				
ZENER VOLTAGE		LOW NOISE LOW LEVEL	LOW LEVEL	LOW IMPEDANCE	
25		1N4117	1N4710		
27		1N4118	1N4711	1N3528	
28		1N4119	1N4712		
30		1N4120	1N4713	1N3529	
33		1N4121	1N4714	1N3530	
36		1N4122	1N4715	1N3531	
39		1N4123	1N4716	1N3532	
43		1N4124	1N4717	1N3533	
47		1N4125		1N3534	
51		1N4126			
56		1N4127			
60		1N4128*			
62		1N4129*			
68		1N4130*			
75		1N4131*			
82		1N4132*			
87		1N4133*			
91		1N4134*			
100		1N4135*			

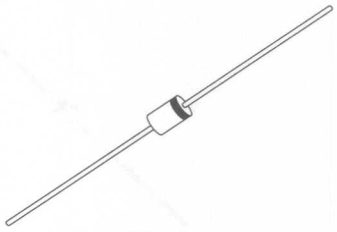
For complete specifications, please consult factory.
Special selections and tight tolerances available.
* Not recommended for new designs.
DO-35 devices are also available in Radial Tape and Reel (Euroform). See page 236.

Zener Diodes (Continued)

POWER	500 mW					
CASE	 DO-35					
ZENER VOLTAGE	INDUSTRY STANDARD	INDUSTRY STANDARD	INDUSTRY STANDARD	ULTRA LOW NOISE	GENERAL PURPOSE	INDUSTRY STANDARD
2.4		1N4370A	1N5221B			1N5985B
2.5			1N5222B			
2.7		1N4371A	1N5223B			1N5986B
2.8			1N5224B			
3.0		1N4372A	1N5225B			1N5987B
3.3		1N746A	1N5226B	1N5518B		1N5988B
3.6		1N747A	1N5227B	1N5519B		1N5989B
3.9		1N748A	1N5228B	1N5520B		1N5990B
4.3		1N749A	1N5229B	1N5521B		1N5991B
4.7		1N750A	1N5230B	1N5522B	1N5728B	1N5992B
5.1		1N751A	1N5231B	1N5523B	1N5729B	1N5993B
5.6		1N752A	1N5232B	1N5524B	1N5730B	1N5994B
6.0			1N5233B			
6.2		1N753A	1N5234B	1N5525B	1N5731B	1N5995B
6.8	1N957B	1N754A	1N5235B	1N5526B	1N5732B	1N5996B
7.5	1N958B	1N755A	1N5236B	1N5527B	1N5733B	1N5997B
8.2	1N959B	1N756A	1N5237B	1N5528B	1N5734B	1N5998B
8.7			1N5238B			
9.1	1N960B	1N757A	1N5239B	1N5529B	1N5735B	1N5999B
10	1N961B	1N758A	1N5240B	1N5530B	1N5736B	1N6000B
11	1N962B		1N5241B	1N5531B	1N5737B	1N6001B
12	1N963B	1N759A	1N5242B	1N5532B	1N5738B	1N6002B
13	1N964B		1N5243B	1N5533B	1N5739B	1N6003B
14			1N5244B	1N5534B		
15	1N965B		1N5245B	1N5535B	1N5740B	1N6004B
16	1N966B		1N5246B	1N5536B	1N5741B	1N6005B
17			1N5247B	1N5537B		
18	1N967B		1N5248B	1N5538B	1N5742B	1N6006B
19			1N5249B	1N5539B		
20	1N968B		1N5250B	1N5540B	1N5743B	1N6007B
22	1N969B		1N5251B	1N5541B	1N5744B	1N6008B
24	1N970B		1N5252B	1N5542B	1N5745B	1N6009B

For complete specifications, please consult factory.
Special selections and tight tolerances available.
DO-35 devices are also available in Radial Tape and Reel (Euroform). See page 236.

Zener Diodes (Continued)

POWER	500 mW					
CASE	 DO-35					
ZENER VOLTAGE	INDUSTRY STANDARD		INDUSTRY STANDARD	ULTRA LOW NOISE	GENERAL PURPOSE	INDUSTRY STANDARD
25			1N5253B	1N5543B		
27	1N971B		1N5254B		1N5746B	1N6010B
28			1N5255B	1N5544B		
30	1N972B		1N5256B	1N5545B	1N5747B	1N6011B
33	1N973B		1N5257B	1N5546B	1N5748B	1N6012B
36	1N974B		1N5258B		1N5749B	1N6013B
39	1N975B		1N5259B		1N5750B	1N6014B
43	1N976B		1N5260B		1N5751B	1N6015B
47	1N977B		1N5261B		1N5752B	1N6016B
51	1N978B		1N5262B		1N5753B	1N6017B
56	1N979B		1N5263B		1N5754B	1N6018B
60			1N5264B*			
62	1N980B*		1N5265B*		1N5755B*	1N6019B*
68	1N981B*		1N5266B*		1N5756B*	1N6020B*
75	1N982B*		1N5267B*		1N5757B*	1N6021B*
82	1N983B*		1N5268B*			1N6022B*
87			1N5269B*			
91	1N984B*		1N5270B*			1N6023B*
100	1N985B*		1N5271B*			1N6024B*
110	1N986B*		1N5272B*			1N6025B*
120	1N987B*		1N5273B*			1N6026B*
130	1N988B*		1N5274B*			1N6027B*
140			1N5275B*			
150	1N989B*		1N5276B*			1N6028B*
160	1N990B*		1N5277B*			1N6029B*
170			1N5278B*			
180	1N991B*		1N5279B*			1N6030B*
190			1N5280B*			
200	1N992B*		1N5281B*			1N6031B*

For complete specifications, please consult factory.
Special selections and tight tolerances available.
* Not recommended for new designs.
DO-35 devices are also available in Radial Tape and Reel (Euroform). See page 236.

Zener Diodes (Continued)

POWER	1.0 WATT				
CASE	 DO-41				
ZENER VOLTAGE	GENERAL PURPOSE	GENERAL PURPOSE	INDUSTRY STANDARD	GENERAL PURPOSE	
3.3			1N4728A		
3.6			1N4729A		
3.9			1N4730A		
4.3			1N4731A		
4.7			1N4732A		
5.1			1N4733A		
5.6			1N4734A		
6.2			1N4735A		
6.8	1N3675B	1N4158B	1N4736A	1N5559B	
7.5	1N3676B	1N4159B	1N4737A	1N5560B	
8.2	1N3677B	1N4160B	1N4738A	1N5561B	
9.1	1N3678B	1N4161B	1N4739A	1N5562B	
10	1N3679B	1N4162B	1N4740A	1N5563B	
11	1N3680B	1N4163B	1N4741A	1N5564B	
12	1N3681B	1N4164B	1N4742A	1N5565B	
13	1N3682B	1N4165B	1N4743A	1N5566B	
15	1N3683B	1N4166B	1N4744A	1N5567B	
16	1N3684B	1N4167B	1N4745A	1N5568B	
18	1N3685B	1N4168B	1N4746A	1N5569B	
20	1N3686B	1N4169B	1N4747A	1N5570B	
22	1N3687B	1N4170B	1N4748A	1N5571B	
24	1N3688B	1N4171B	1N4749A	1N5572B	
27	1N3689B	1N4172B	1N4750A	1N5573B	
30	1N3690B	1N4173B	1N4751A	1N5574B	

For complete specifications, please consult factory.

Zener Diodes (Continued)

POWER	1.0 WATT				
CASE	 DO-41				
ZENER VOLTAGE	GENERAL PURPOSE	GENERAL PURPOSE	INDUSTRY STANDARD	GENERAL PURPOSE	HIGH VOLTAGE
33	1N3691B	1N4174B	1N4752A	1N5575B	
36	1N3692B	1N4175B	1N4753A	1N5576B	
39	1N3693B	1N4176B	1N4754A	1N5577B	
43	1N3694B	1N4177B	1N4755A	1N5578B	
47	1N3695B	1N4175B	1N4756A	1N5579B	
51	1N3696B	1N4179B	1N4757A	1N5580B	
56	1N3697B	1N4180B	1N4758A	1N5581B	
62	1N3698B*	1N4181B*	1N4759A*	1N5582B*	
68	1N3699B*	1N4182B*	1N4760A*	1N5583B*	
75	1N3700B*	1N4183B*	1N4761A*	1N5584B*	
82	1N3701B*	1N4184B*	1N4762A*	1N5585B*	
91	1N3702B*	1N4185B*	1N4763A*	1N5586B*	
100	1N3703B	1N4186B	1N4764A	1N5587B	C1Z100B
110	1N3704B	1N4187B		1N5588B	C1Z110B
120	1N3705B	1N4188B		1N5589B	C1Z120B
130	1N3706B	1N4189B		1N5590B	C1Z130B
150	1N3707B	1N4190B		1N5591B	C1Z150B
160	1N3708B	1N4191B		1N5592B	C1Z160B
180	1N3709B	1N4192B		1N5593B	C1Z180B
200	1N3710B	1N4193B		1N5594B	C1Z200B
300					C1Z300B
330					C1Z330B

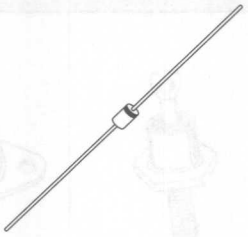
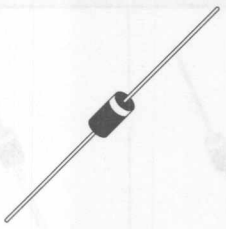
For complete specifications, please consult factory.
* Not recommended for new designs.

Zener Diodes (Continued)

POWER	1.5 WATT		2.0 WATT	2.5 WATT
CASE	DO-41			AX-5W
ZENER VOLTAGE	HIGH PERFORMANCE	INDUSTRY STANDARD		GENERAL PURPOSE
3.3		1N5913B		1N5008A
3.6		1N5914B		1N5009A*
3.9		1N5915B		1N5010A
4.3		1N5916B		1N5011A
4.7		1N5917B		1N5012A
5.1		1N5918B		1N5013A
5.6		1N5919B		1N5014A
6.2	1N4460	1N5920B		1N5015A
6.8	1N4461	1N5921B		1N5016A
7.5	1N4462	1N5922B		1N5017A
8.2	1N4463	1N5923B		1N5018A
9.1	1N4464	1N5924B		1N5019A
10	1N4465	1N5925B		1N5020A
11	1N4466	1N5926B		1N5021A
12	1N4467	1N5927B		1N5022A
13	1N4468	1N5928B		1N5023A
14				1N5024A
15	1N4469	1N5929B		1N5025A
16	1N4470	1N5930B		1N5026A
17				1N5027A
18	1N4471	1N5931B		1N5028A
19				1N5029A
20	1N4472	1N5932B		1N5030A
22	1N4473	1N5933B		1N5031A
24	1N4474	1N5934B		1N5032A
25				1N5033A*
27	1N4475	1N5935B		1N5034A
30	1N4476	1N5936B		1N5035A

For complete specifications, please consult factory.
* Not recommended for new designs.

Zener Diodes (Continued)

POWER	1.5 WATT		2.0 WATT	2.5 WATT
CASE	 DO-41			 AX-5W
ZENER VOLTAGE	HIGH PERFORMANCE	INDUSTRY STANDARD	HIGH VOLTAGE	GENERAL PURPOSE
33	1N4477	1N5937B		1N5036A
36	1N4478	1N5938B		1N5037A
39	1N4479	1N5939B		1N5038A
43	1N4480	1N5940B		1N5039A
45				1N5040A
47	1N4481	1N5941B		1N5041A
50				1N5042A
51	1N4482	1N5942B		1N5043A
52				1N5044A
56	1N4483	1N5943B		1N5045A
62	1N4484*	1N5944B*		1N5046A
68	1N4485*	1N5945B*		1N5047A
75	1N4486*	1N5946B*		1N5048A
82	1N4487*	1N5947B*		1N5049A
91	1N4488*	1N5948B*		1N5050A
100	1N4489	1N5949B	C2Z100B	1N5051A
110	1N4490	1N5950B	C2Z110B	
120	1N4491	1N5951B	C2Z120B	
130	1N4492	1N5952B	C2Z130B	
150	1N4493	1N5953B	C2Z150B	
160	1N4494	1N5954B	C2Z160B	
180	1N4495	1N5955B	C2Z180B	
200	1N4496	1N5956B	C2Z200B	
300			C2Z300B	
330			C2Z330B	

For complete specifications, please consult factory.
* Not recommended for new designs.

Zener Diodes (Continued)

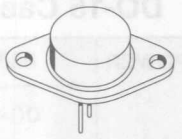
POWER	5.0 WATT		10 WATT	50 WATT	
CASE	AX-5W	DO-201	DO-4**	TO-3**	DO-5**
ZENER VOLTAGE	INDUSTRY STANDARD	RECOMMENDED FOR NEW DESIGNS	GENERAL PURPOSE	GENERAL PURPOSE	GENERAL PURPOSE
3.6	1N5334B*				
3.9	1N5335B				
4.3	1N5336B				
4.7	1N5337B				
5.1	1N5338B				
5.6	1N5339B				
6.0	1N5340B*				
6.2	1N5341B				
6.8	1N5342B	CZ5342B			
7.5	1N5343B	CZ5343B			
8.2	1N5344B	CZ5344B			
8.7	1N5345B*	CZ5345B			
9.1	1N5346B	CZ5346B			
10	1N5347B*	CZ5347B	1N2974B	1N2808B	1N3309B
11	1N5348B*	CZ5348B	1N2975B	1N2809B	1N3310B
12	1N5349B	CZ5349B	1N2976B	1N2810B	1N3311B
13	1N5350B	CZ5350B	1N2977B	1N2811B	1N3312B
14	1N5351B	CZ5351B	1N2978B	1N2812B	1N3313B
15	1N5352B	CZ5352B	1N2979B	1N2813B	1N3314B
16	1N5353B	CZ5353B	1N2980B	1N2814B	1N3315B
17	1N5354B	CZ5354B	1N2981B	1N2815B	1N3316B
18	1N5355B	CZ5355B	1N2982B	1N2816B	1N3317B
19	1N5356B	CZ5356B	1N2983B	1N2817B	1N3318B
20	1N5357B	CZ5357B	1N2984B	1N2818B	1N3319B
22	1N5358B	CZ5358B	1N2985B	1N2819B	1N3320B
24	1N5359B	CZ5359B	1N2986B	1N2820B	1N3321B
25	1N5360B*	CZ5360B	1N2987B	1N2821B	1N3322B
27	1N5361B	CZ5361B	1N2988B	1N2822B	1N3323B
28	1N5362B	CZ5362B			

For complete specifications, please consult factory.

** Reverse polarity available. Simply change "B" suffix to "RB."

* Not recommended for new designs.

Zener Diodes (Continued)

POWER	5.0 WATT		10 WATT	50 WATT	
					
CASE	AX-5W	DO-201	DO-4**	TO-3**	DO-5**
ZENER VOLTAGE	INDUSTRY STANDARD	RECOMMENDED FOR NEW DESIGNS	GENERAL PURPOSE	GENERAL PURPOSE	GENERAL PURPOSE
30	1N5363B	CZ5363B	1N2989B	1N2823B	1N3324B
33	1N5364B	CZ5364B	1N2990B	1N2824B	1N3325B
36	1N5365B	CZ5365B	1N2991B	1N2825B	1N3326B
39	1N5366B	CZ5366B	1N2992B	1N2826B	1N3327B
43	1N5367B	CZ5367B	1N2993B	1N2827B	1N3328B
45			1N2994B	1N2828B	1N3329B
47	1N5368B	CZ5368B	1N2995B	1N2829B	1N3330B
50			1N2996B	1N2830B	1N3331B
51	1N5369B	CZ5369B	1N2997B	1N2831B	1N3332B
52			1N2998B		1N3333B
56	1N5370B	CZ5370B	1N2999B	1N2832B	1N3334B
60	1N5371B*	CZ5371B			
62	1N5372B	CZ5372B	1N3000B	1N2833B	1N3335B
68	1N5373B	CZ5373B	1N3001B	1N2834B	1N3336B
75	1N5374B	CZ5374B	1N3002B	1N2835B	1N3337B
82	1N5375B	CZ5375B	1N3003B	1N2836B	1N3338B
87	1N5376B*	CZ5376B			
91	1N5377B	CZ5377B	1N3004B	1N2837B	1N3339B
100	1N5378B	CZ5378B	1N3005B	1N2838B	1N3340B
105			1N3006B	1N2839B	1N3341B
110	1N5379B	CZ5379B	1N3007B	1N2840B	1N3342B
120	1N5380B	CZ5380B	1N3008B	1N2841B	1N3343B
130	1N5381B	CZ5381B	1N3009B	1N2842B	1N3344B
140	1N5382B*	CZ5382B	1N3010B		1N3345B
150	1N5383B	CZ5383B	1N3011B	1N2843B	1N3346B
160	1N5384B	CZ5384B	1N3012B	1N2844B	1N3347B
170	1N5385B*	CZ5385B	1N3013B		
175					1N3348B
180	1N5386B	CZ5386B	1N3014B	1N2845B	1N3349B
190	1N5387B*	CZ5387B			
200	1N5388B	CZ5388B	1N3015B	1N2846B	1N3350B

For complete specifications, please consult factory.

** Reverse polarity available. Simply change "B" suffix to "RB."

* Not recommended for new designs.

Transient Voltage Suppressors (TVS)
600W Thru 1500W

DO-15 Case

DO-201 Case

NEW

POWER	600W	1500W		
	DO-15	DO-201		
V_{BR}				CONSTRUCTION
6.8	P6KE6.8A	1.5CE6.8A	1N6267A	UNIPOLAR
6.8	P6KE6.8CA	1.5CE6.8CA		BIPOLAR
7.5	P6KE7.5A	1.5CE7.5A	1N6268A	UNIPOLAR
7.5	P6KE7.5CA	1.5CE7.5CA		BIPOLAR
8.2	P6KE8.2A	1.5CE8.2A	1N6269A	UNIPOLAR
8.2	P6KE8.2CA	1.5CE8.2CA		BIPOLAR
9.1	P6KE9.1A	1.5CE9.1A	1N6270A	UNIPOLAR
9.1	P6KE9.1CA	1.5CE 9.1CA		BIPOLAR
10	P6KE10A	1.5CE10A	1N6271A	UNIPOLAR
10	P6KE10CA	1.5CE10CA		BIPOLAR
11	P6KE11A	1.5CE11A	1N6272A	UNIPOLAR
11	P6KE11CA	1.5CE11CA		BIPOLAR
12	P6KE12A	1.5CE12A	1N6273A	UNIPOLAR
12	P6KE12CA	1.5CE12CA		BIPOLAR
13	P6KE13A	1.5CE13A	1N6274A	UNIPOLAR
13	P6KE13CA	1.5CE13CA		BIPOLAR
15	P6KE15A	1.5CE15A	1N6275A	UNIPOLAR
15	P6KE15CA	1.5CE15CA		BIPOLAR
16	P6KE16A	1.5CE16A	1N6276A	UNIPOLAR
16	P6KE16CA	1.5CE16CA		BIPOLAR
18	P6KE18A	1.5CE18A	1N6277A	UNIPOLAR
18	P6KE18CA	1.5CE18CA		BIPOLAR
20	P6KE20A	1.5CE20A	1N6278A	UNIPOLAR
20	P6KE20CA	1.5CE20CA		BIPOLAR
22	P6KE22A	1.5CE22A	1N6279A	UNIPOLAR
22	P6KE22CA	1.5CE22CA		BIPOLAR
24	P6KE24A	1.5CE24A	1N6280A	UNIPOLAR
24	P6KE24CA	1.5CE24CA		BIPOLAR

Transient Voltage Suppressors (TVS)
(Continued)

POWER	600W	1500W		
	DO-15	DO-201		
V_{BR}				CONSTRUCTION
27	P6KE27A	1.5CE27A	1N6281A	UNIPOLAR
27	P6KE27CA	1.5CE27CA		BIPOLAR
30	P6KE30A	1.5CE30A	1N6282A	UNIPOLAR
30	P6KE30CA	1.5CE30CA		BIPOLAR
33	P6KE33A	1.5CE33A	1N6283A	UNIPOLAR
33	P6KE33CA	1.5CE33CA		BIPOLAR
36	P6KE36A	1.5CE36A	1N6284A	UNIPOLAR
36	P6KE36CA	1.5CE36CA		BIPOLAR
39	P6KE39A	1.5CE39A	1N6285A	UNIPOLAR
39	P6KE39CA	1.5CE39CA		BIPOLAR
43	P6KE43A	1.5CE43A	1N6286A	UNIPOLAR
43	P6KE43CA	1.5CE43CA		BIPOLAR
47	P6KE47A	1.5CE47A	1N6287A	UNIPOLAR
47	P6KE47CA	1.5CE47CA		BIPOLAR
51	P6KE51A	1.5CE51A	1N6288A	UNIPOLAR
51	P6KE51CA	1.5CE51CA		BIPOLAR
56	P6KE56A	1.5CE56A	1N6289A	UNIPOLAR
56	P6KE56CA	1.5CE56CA		BIPOLAR
62	P6KE62A	1.5CE62A	1N6290A	UNIPOLAR
62	P6KE62CA	1.5CE62CA		BIPOLAR
68	P6KE68A	1.5CE68A	1N6291A	UNIPOLAR
68	P6KE68CA	1.5CE68CA		BIPOLAR
75	P6KE75A	1.5CE75A	1N6292A	UNIPOLAR
75	P6KE75CA	1.5CE75CA		BIPOLAR
82	P6KE82A	1.5CE82A	1N6293A	UNIPOLAR
82	P6KE82CA	1.5CE82CA		BIPOLAR
91	P6KE91A	1.5CE91A	1N6294A	UNIPOLAR
91	P6KE91CA	1.5CE91CA		BIPOLAR

Transient Voltage Suppressors (TVS)
(Continued)

POWER	600W	1500W		
	DO-15	DO-201		
VBR				CONSTRUCTION
100	P6KE100A	1.5CE100A	1N6295A	UNIPOLAR
100	P6KE100CA	1.5CE100CA		BIPOLAR
110	P6KE110A	1.5CE110A	1N6296A	UNIPOLAR
110	P6KE110CA	1.5CE110CA		BIPOLAR
120	P6KE120A	1.5CE120A	1N6297A	UNIPOLAR
120	P6KE120CA	1.5CE120CA		BIPOLAR
130	P6KE130A	1.5CE130A	1N6298A	UNIPOLAR
130	P6KE130CA	1.5CE130CA		BIPOLAR
150	P6KE150A	1.5CE150A	1N6299A	UNIPOLAR
150	P6KE150CA	1.5CE150CA		BIPOLAR
160	P6KE160A	1.5CE160A	1N6300A	UNIPOLAR
160	P6KE160CA	1.5CE160CA		BIPOLAR
170	P6KE170A	1.5CE170A	1N6301A	UNIPOLAR
170	P6KE170CA	1.5CE170CA		BIPOLAR
180	P6KE180A	1.5CE180A	1N6302A	UNIPOLAR
180	P6KE180CA	1.5CE180CA		BIPOLAR
200	P6KE200A	1.5CE200A	1N6303A	UNIPOLAR
200	P6KE200CA	1.5CE200CA		BIPOLAR
220	P6KE220A	1.5CE220A		UNIPOLAR
220	P6KE220CA	1.5CE220CA		BIPOLAR
250	P6KE250A	1.5CE250A		UNIPOLAR
250	P6KE250CA	1.5CE250CA		BIPOLAR
300	P6KE300A	1.5CE300A		UNIPOLAR
300	P6KE300CA	1.5CE300CA		BIPOLAR
350	P6KE350A	1.5CE350A		UNIPOLAR
350	P6KE350CA	1.5CE350CA		BIPOLAR
400	P6KE400A	1.5CE400A		UNIPOLAR
400	P6KE400CA	1.5CE400CA		BIPOLAR

Stabistors (Forward Reference Diodes)

DO-41

DO-35

TYPE NO.	V_F (V)		@ I_F (mA)	V_F (V)		@ I_F (mA)	V_F (V)		@ I_F (mA)	V_F (V)		@ I_F (mA)	V_F (V)		@ I_F (mA)	CASE
	MIN	MAX		MIN	MAX		MIN	MAX		MIN	MAX		MIN	MAX		
1N816	--	--	--	--	--	--	0.58	0.70	1.0	--	--	--	--	1.00	100	DO-35
C1N4156	--	--	--	--	--	--	1.21	1.41	1.0	1.38	1.58	10	1.54	1.84	100	DO-35
CMPD200	0.90	1.00	0.01	1.05	1.16	0.10	1.22	1.34	1.0	1.39	1.54	10	1.60	1.76	100	DO-35
CMPD300	1.40	1.54	0.01	1.62	1.78	0.10	1.84	2.03	1.0	2.10	2.33	10	2.40	2.65	100	DO-35
CMPD400	1.82	2.01	0.01	2.14	2.36	0.10	2.47	2.71	1.0	2.80	3.07	10	3.16	3.49	100	DO-35
CN4156	--	--	--	--	--	--	1.21	1.41	1.0	1.38	1.58	10	1.54	1.84	100	DO-35
CN4157	--	--	--	--	--	--	1.85	2.05	1.0	2.12	2.32	10	2.36	2.66	100	DO-35
CN5179	--	--	--	--	--	--	2.20	2.80	1.0	2.60	3.20	10	3.00	3.70	100	DO-35
CMZ2360	--	--	--	--	--	--	--	--	--	0.63	0.71	10	--	--	--	DO-41
CMZ2361	--	--	--	--	--	--	--	--	--	1.24	1.44	10	--	--	--	DO-35
CSTB567	--	--	--	--	--	--	--	--	--	1.31	1.61	10	--	--	--	DO-35
CSTB568	--	--	--	--	--	--	--	--	--	2.09	2.31	10	--	--	--	DO-35
CSTB569	--	--	--	--	--	--	--	--	--	2.72	3.01	10	--	--	--	DO-35

Current Limiting Diodes

What is a Current Limiting Diode?

A Current Limiting Diode, also known as a "Current Regulating Diode" or a "Constant Current Diode," performs quite a unique function. Similar to a zener diode, which regulates voltage at a particular current, the CLD limits or regulates current over a wide voltage range. The CLD is diffused using a "Field Effect" process similar to the diffusion techniques used in manufacturing JFETs with the electrical characteristics optimized for high output impedance and current regulating capability.

How Does a Current Limiting Diode Operate?

In operation the CLD regulates the amount of current that can flow over a voltage range of about 1 to 100 volts. The equivalent circuit of the CLD is a current generator in series with a parallel combination of the dynamic impedance and the junction capacitance (Figure 1).

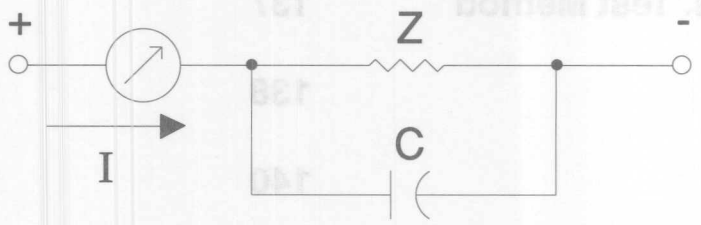


Figure 1. The CLD Equivalent Circuit

The shunt capacitance of Central's CLD is about 4-10 pF over the useful operating voltage range.

Outlined below are typical CLD Characteristics, Symbols, Parameters, and Definitions.

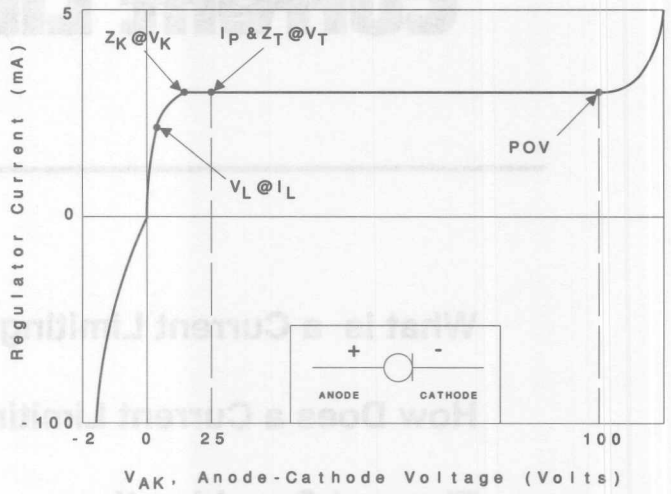


Figure 2. CLD Characteristic Curve

I_L - Limiting Current: 80% of Ip minimum used to determine Limiting Voltage V_L.

Ip - Pinch-off Current: Regulator current at specified Test Voltage (V_T = 25V).

POV - Peak Operating Voltage: Maximum voltage to be applied to device.

TC - Current Temperature Coefficient.

V_{AK} - Anode to Cathode Voltage.

V_K - Knee Impedance Test Voltage: Specified voltage used to establish Knee Impedance (Z_K).

V_L - Limiting Voltage: Measured at I_L, V_L together with Knee AC impedance (Z_K), indicates the Knee characteristics of the device.

V_T - Test Voltage: Voltage at which Ip and Z_T are specified.

Z_K - Knee AC Impedance at Testing Voltage: To test for Z_K, a 90 Hz signal (V_K), with RMS value equal to 10% of test voltage, V_K, is superimposed on V_K: $Z_K = V_K/i_K$, where i_K is the resultant AC current due to V_K. To provide the most constant current, Z_K should be as high as possible.

Z_T - AC Impedance at Test Voltage: Specified as a minimum value. To test for Z_T, a 90 Hz signal with RMS value equal to 10% of Test Voltage (V_T), is superimposed on V_T.

As shown by the characteristic curve (Figure 2) and cross sectional diagram (Figure 3), the CLD begins to conduct when a reverse biased voltage is applied from the cathode to the anode or PN junction. As the reverse biased voltage is increased to V_L, the current increases due to the bulk resistance of the N region. As the current approaches the knee section of the curve, a depletion region develops between the N region and the P-type gate. This depletion region decreases the current path in the N region slowing the increase of current flow. Eventually, the depletion region meets the P-type gate and pinch-off occurs, allowing current flow to become constant and almost independent of applied voltage until PN junction breakdown occurs somewhere above POV. When the polarity of the applied voltage is reversed and a forward bias is applied to the PN junction, the CLD exhibits characteristics similar to those of a forward biased diode or rectifier.

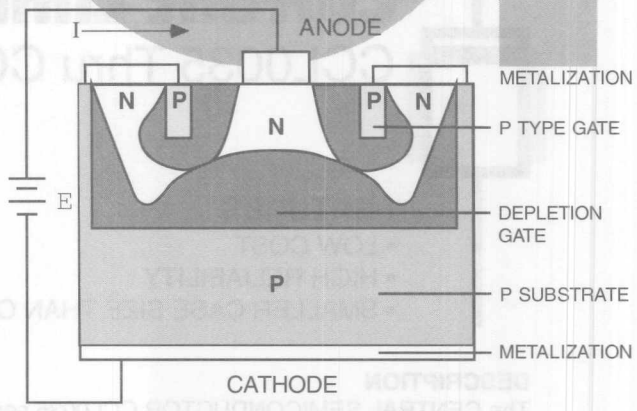


Figure 3. CLD Chip Cross Section

Thermal Considerations

Central Semiconductor's CCL0035 thru CCL5750 series of current limiting diodes covers a current range of 35μA to 5.75mA in 12 different current groups. These devices operate over a temperature range of -65°C to +200°C and have a moderate temperature coefficient that can cause Ip drift. This Ip drift can sometimes be a problem if not taken into account when designing precision circuitry that must operate over a wide temperature range. The Ip drift phenomenon becomes more evident with higher current CCL types because the temperature coefficient increases and the heating due to power dissipation is greater.

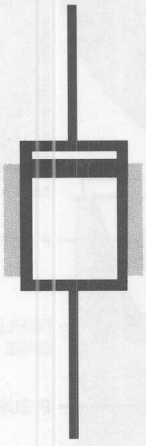
Outlined at right: Calculations of Ip change for two CCL types assuming heating is due to device dissipation only.

Type	Ip(nom)	TC(max)	Dissipation @25V	θJL	ΔIp	
					%	mA
CCL1000	1.1mA	–0.37%/°C	27.5mW	200°C/W	–2.03	–0.022
CCL5750	5.75mA	–0.53%/°C	143.75mW	200°C/W	–15.2	–0.876

In most applications the absolute value of the current need not be precise as long as it is constant and in the desired range. However, the Ip drift can cause correlation problems between vendor and customer if testing is not specified precisely.

Variations in Ip Measurement vs. Test Method

There are two basic methods of measuring Ip: Pulsed and DC steady state. Pulsed testing is accomplished using computerized test equipment with a programmed test time in the millisecond area. DC steady state testing is accomplished using a 90-second dwell time with the device leads connected to an infinite heat sink 0.375 inches from the body. Central Semiconductor uses the pulsed test technique because of its accuracy, repeatability and speed. The DC steady state method will not correlate well with the pulsed method at the higher current levels due to effects of heating.



Current Limiting Diode

CCL0035 Thru CCL5750 JEDEC DO-35 Case

FEATURES

- LOW COST
- HIGH RELIABILITY
- SMALLER CASE SIZE THAN COMPETITION
- SPECIAL SELECTIONS AVAILABLE
- SUPERIOR LOT-TO-LOT CONSISTENCY
- SURFACE MOUNT DEVICES AVAILABLE

DESCRIPTION

The CENTRAL SEMICONDUCTOR CCL0035 series types are silicon field effect current regulator diodes designed for applications requiring a constant current over a wide voltage range. These devices are manufactured in the cost-effective DO-35 double plug case which provides many benefits to the user, including space savings and improved thermal characteristics. Special selections of I_P (regulator current) are available for critical applications. This series is the most cost-effective of the current limiting diode product family.

MAXIMUM RATINGS (T_L = 75°C)	SYMBOL		UNIT
Peak Operating Voltage	POV	100	V
Power Dissipation	P_D	600	mW
Operating and Storage Junction Temperature	T_J,T_{STG}	-65 to +200	°C

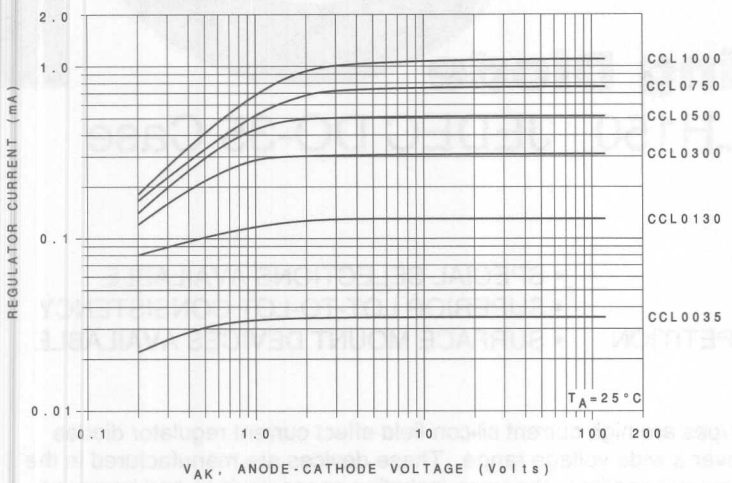
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

TYPE NO.	REGULATOR CURRENT(1)			DYNAMIC IMPEDANCE	KNEE IMPEDANCE	LIMITING VOLTAGE	TEMPERATURE COEFFICIENT
	I_P @ V_T = 25V			Z_T @ V_T = 25V	Z_K @ V_K = 6.0V	V_L @ I_L= 0.8 I_P MIN	TC*
	mA			MΩ	MΩ	V	%/°C
	MIN	NOM	MAX	MIN	MIN	MAX	
CCL0035	0.010	0.035	0.060	8.0	4.0	0.4	+2.10 to +0.10
CCL0130	0.050	0.130	0.210	6.0	2.0	0.6	+2.10 to +0.10
CCL0300	0.200	0.310	0.420	4.0	1.0	0.8	+0.40 to -0.20
CCL0500	0.400	0.515	0.630	2.0	0.5	1.1	+0.15 to -0.25
CCL0750	0.600	0.760	0.920	1.0	0.2	1.4	0.0 to -0.32
CCL1000	0.880	1.100	1.320	0.65	0.1	1.7	-0.10 to -0.37
CCL1500	1.280	1.500	1.720	0.45	0.07	2.0	-0.13 to -0.40
CCL2000	1.680	2.000	2.320	0.35	0.05	2.3	-0.15 to -0.42
CCL2700	2.280	2.690	3.100	0.30	0.03	2.7	-0.18 to -0.45
CCL3500	3.000	3.550	4.100	0.25	0.02	3.2	-0.20 to -0.47
CCL4500	3.900	4.500	5.100	0.20	0.01	3.7	-0.22 to -0.50
CCL5750	5.000	5.750	6.500	0.05	0.005	4.5	0.25 to -0.53

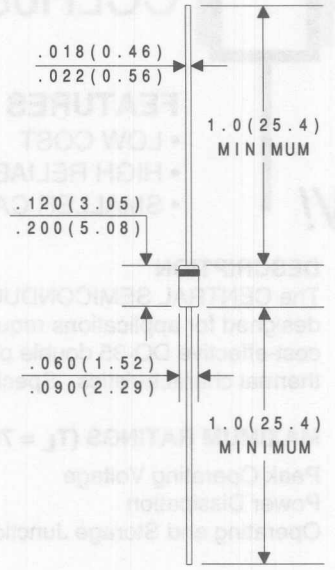
(1) PULSED METHOD. PULSE WIDTH (ms) = $\frac{27.5}{I_P \text{ NOM (mA)}}$

*The Temperature Coefficient is measured between +25°C and +50°C

Typical Regulator Current vs. Voltage

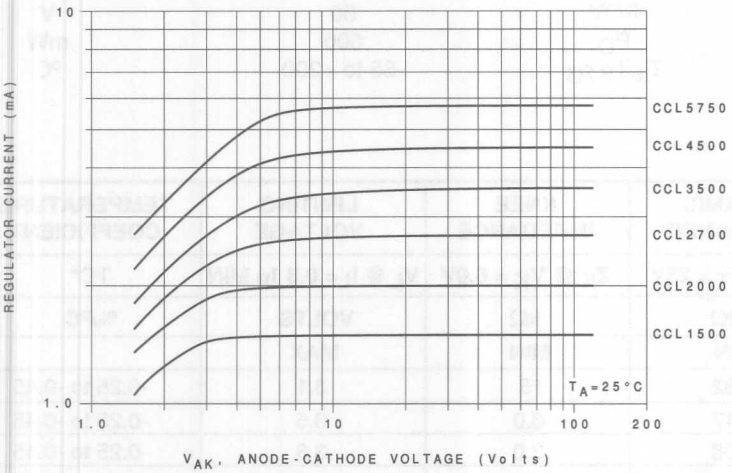


HERMETICALLY SEALED GLASS CASE
WITH TINNED COPPER LEADS

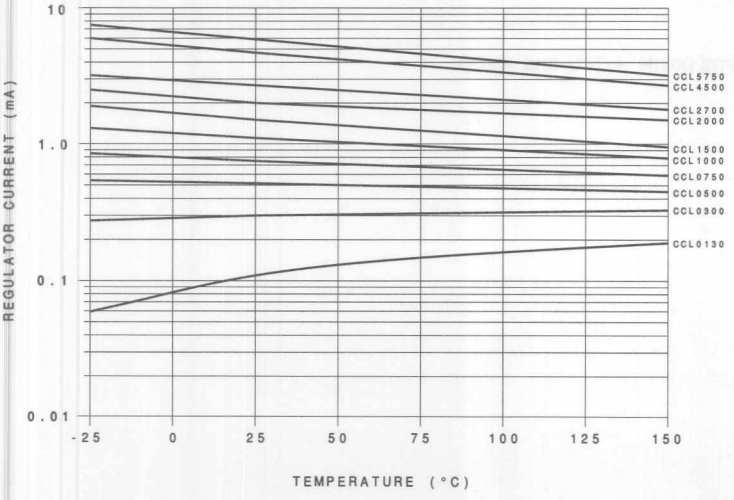


Dimensions in Inches (mm).

Typical Regulator Current vs. Voltage



Typical Regulator Current vs. Temperature



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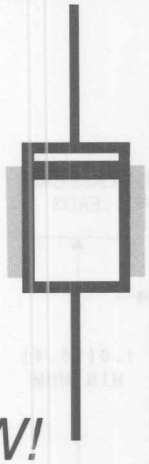


High Current Current Limiting Diode

CCLH080 Thru CCLH150 JEDEC DO-35 Case

NEW!

FEATURES

- LOW COST
- HIGH RELIABILITY
- SMALLER CASE SIZE THAN COMPETITION
- SPECIAL SELECTIONS AVAILABLE
- SUPERIOR LOT-TO-LOT CONSISTENCY
- SURFACE MOUNT DEVICES AVAILABLE

DESCRIPTION

The CENTRAL SEMICONDUCTOR CCLH080 series types are high current silicon field effect current regulator diodes designed for applications requiring a constant current over a wide voltage range. These devices are manufactured in the cost-effective DO-35 double plug case which provides many benefits to the user, including space savings and improved thermal characteristics. Special selections of I_P (regulator current) are available for critical applications.

MAXIMUM RATINGS (T_L = 75°C)	SYMBOL		UNIT
Peak Operating Voltage	POV	50	V
Power Dissipation	P_D	600	mW
Operating and Storage Junction Temperature	T_J,T_{STG}	-65 to +200	°C

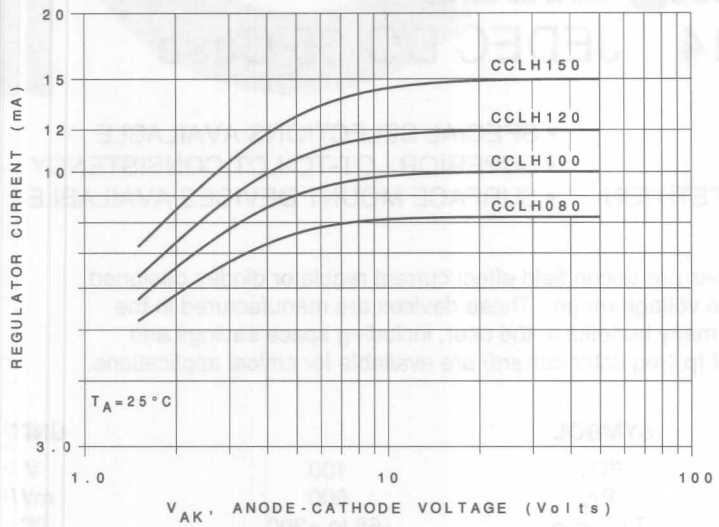
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

TYPE NO.	REGULATOR CURRENT(1)			DYNAMIC IMPEDANCE	KNEE IMPEDANCE	LIMITING VOLTAGE	TEMPERATURE COEFFICIENT
	I_P @ V_T = 25V			Z_T @ V_T = 25V	Z_K @ V_K = 6.0V	V_L @ I_L= 0.8 I_P MIN	TC*
	mA			MΩ	kΩ	VOLTS	%/°C
	MIN	NOM	MAX	MIN	MIN	MAX	
CCLH080	6.56	8.20	9.84	0.32	15	3.1	-0.25 to -0.45
CCLH100	8.00	10.0	12.0	0.17	6.0	3.5	-0.25 to -0.45
CCLH120	9.60	12.0	14.4	0.08	3.0	3.8	-0.25 to -0.45
CCLH150	12.0	15.0	18.0	0.03	2.0	4.3	-0.25 to -0.45

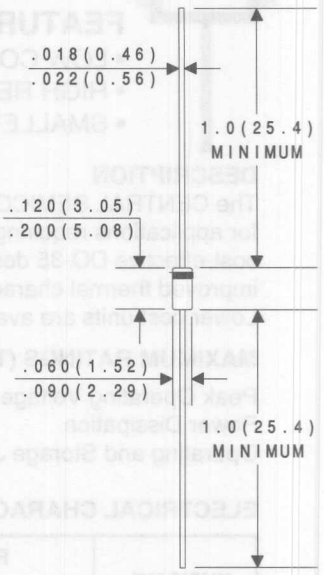
(1) PULSED METHOD. PULSE WIDTH (ms) = $\frac{27.5}{I_P \text{ NOM (mA)}}$

*The Temperature Coefficient is measured between the following points: +25°C and +50°C

Typical Regulator Current vs. Voltage

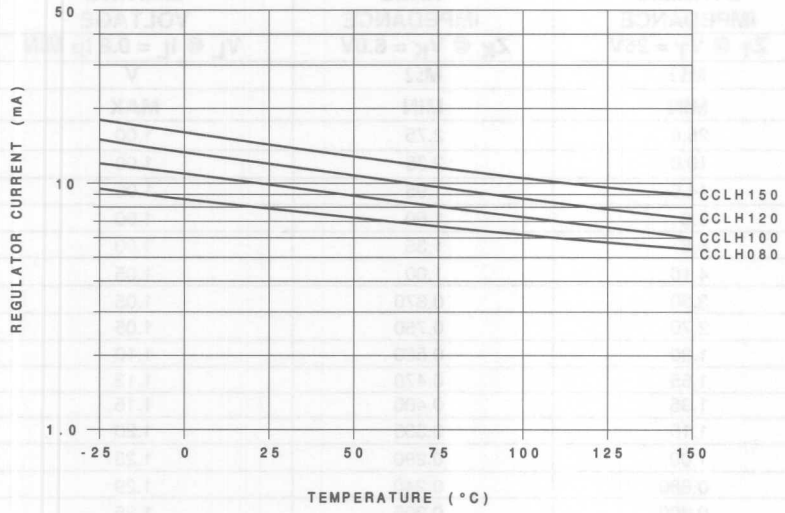


HERMETICALLY SEALED GLASS CASE
WITH TINNED COPPER LEADS



Dimensions in Inches (mm).

Typical Regulator Current vs. Temperature



Central™ Semiconductor Corp.

Current Limiting Diode

1N5283 Thru 1N5314 JEDEC DO-35 Case

FEATURES

- LOW COST
- HIGH RELIABILITY
- SMALLER CASE SIZE THAN COMPETITION
- SPECIAL SELECTIONS AVAILABLE
- SUPERIOR LOT-TO-LOT CONSISTENCY
- SURFACE MOUNT DEVICES AVAILABLE

DESCRIPTION

The CENTRAL SEMICONDUCTOR 1N5283 series types are silicon field effect current regulator diodes designed for applications requiring a constant current over a wide voltage range. These devices are manufactured in the cost-effective DO-35 double plug case which provides many benefits to the user, including space savings and improved thermal characteristics. Special selections of Ip (regulator current) are available for critical applications. Lower cost units are available in the CCL0035 series.

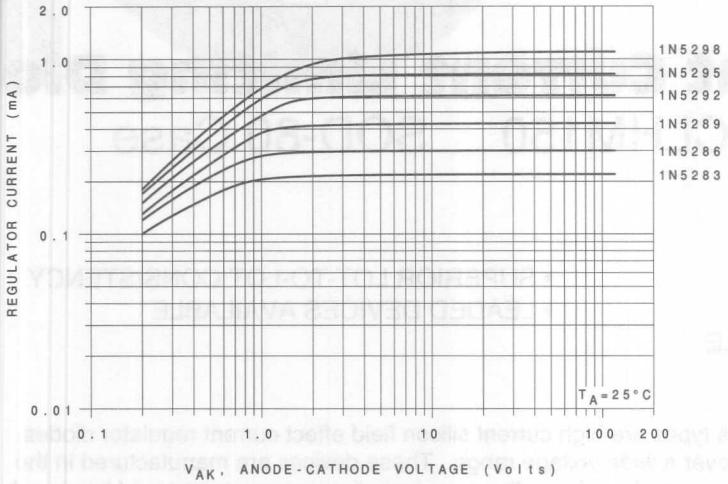
MAXIMUM RATINGS (T_L = 75°C)	SYMBOL		UNIT
Peak Operating Voltage	POV	100	V
Power Dissipation	P_D	600	mW
Operating and Storage Junction Temperature	T_J,T_{STG}	-65 to +200	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

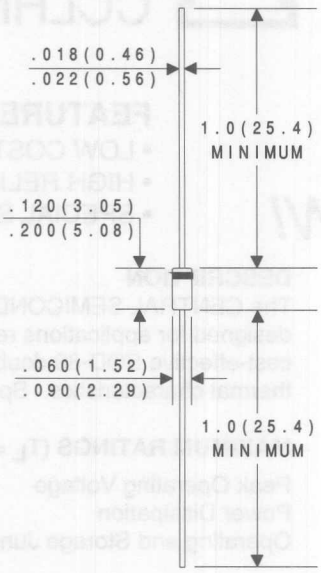
TYPE NO.	REGULATOR CURRENT(1)			DYNAMIC IMPEDANCE	KNEE IMPEDANCE	LIMITING VOLTAGE
	I_P @ V_T = 25V			Z_T @ V_T = 25V	Z_K @ V_K = 6.0V	V_L @ I_L = 0.8 I_P MIN
	mA			MΩ	MΩ	V
	MIN	NOM	MAX	MIN	MIN	MAX
1N5283	0.198	0.22	0.242	25.0	2.75	1.00
1N5284	0.216	0.24	0.264	19.0	2.35	1.00
1N5285	0.243	0.27	0.297	14.0	1.95	1.00
1N5286	0.270	0.30	0.330	9.0	1.60	1.00
1N5287	0.297	0.33	0.363	6.6	1.35	1.00
1N5288	0.351	0.39	0.429	4.10	1.00	1.05
1N5289	0.387	0.43	0.473	3.30	0.870	1.05
1N5290	0.423	0.47	0.517	2.70	0.750	1.05
1N5291	0.504	0.56	0.616	1.90	0.560	1.10
1N5292	0.558	0.62	0.682	1.55	0.470	1.13
1N5293	0.612	0.68	0.748	1.35	0.400	1.15
1N5294	0.675	0.75	0.825	1.15	0.335	1.20
1N5295	0.738	0.82	0.902	1.00	0.290	1.25
1N5296	0.819	0.91	1.001	0.880	0.240	1.29
1N5297	0.900	1.00	1.10	0.800	0.205	1.35
1N5298	0.990	1.10	1.21	0.700	0.180	1.40
1N5299	1.08	1.20	1.32	0.640	0.155	1.45
1N5300	1.17	1.30	1.43	0.580	0.135	1.50
1N5301	1.26	1.40	1.54	0.540	0.115	1.55
1N5302	1.35	1.50	1.65	0.510	0.105	1.60
1N5303	1.44	1.60	1.76	0.475	0.092	1.65
1N5304	1.62	1.80	1.98	0.420	0.074	1.75
1N5305	1.80	2.00	2.20	0.395	0.061	1.85
1N5306	1.98	2.20	2.42	0.370	0.052	1.95
1N5307	2.16	2.40	2.64	0.345	0.044	2.00
1N5308	2.43	2.70	2.97	0.320	0.035	2.15
1N5309	2.70	3.00	3.30	0.300	0.029	2.25
1N5310	2.97	3.30	3.63	0.280	0.024	2.35
1N5311	3.24	3.60	3.96	0.265	0.020	2.50
1N5312	3.51	3.90	4.29	0.255	0.017	2.60
1N5313	3.87	4.30	4.73	0.245	0.014	2.75
1N5314	4.23	4.70	5.17	0.235	0.012	2.90

(1) PULSED METHOD. PULSE WIDTH (ms) = $\frac{27.5}{I_P \text{ NOM (mA)}}$

Typical Regulator Current vs. Voltage



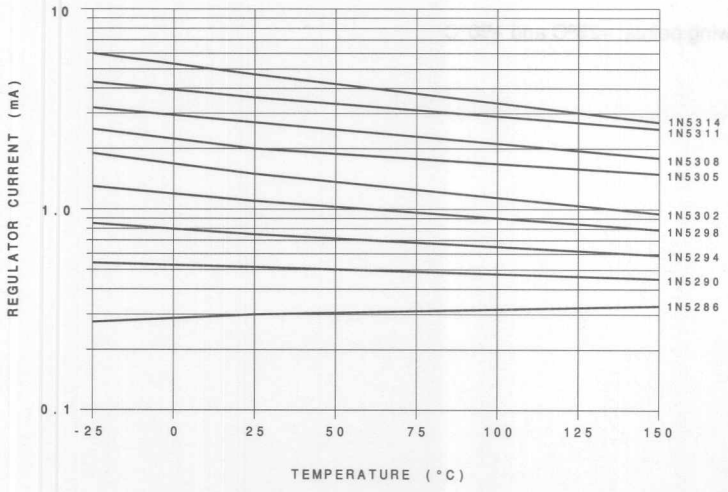
HERMETICALLY SEALED GLASS CASE
WITH TINNED COPPER LEADS



Dimensions in Inches (mm).

Typical Regulator Current vs. Voltage

Typical Regulator Current vs. Temperature



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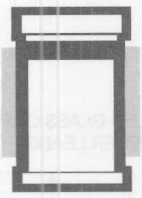


High Current Surface Mount Current Limiting Diode

CCLHM080 Thru CCLHM150 SOD-80 Case

NEW!

FEATURES

- LOW COST
- HIGH RELIABILITY
- SPECIAL SELECTIONS AVAILABLE
- SUPERIOR LOT-TO-LOT CONSISTENCY
- LEADED DEVICES AVAILABLE

DESCRIPTION

The CENTRAL SEMICONDUCTOR CCLHM080 series types are high current silicon field effect current regulator diodes designed for applications requiring a constant current over a wide voltage range. These devices are manufactured in the cost-effective SOD-80 double plug case which provides many benefits to the user, including space savings and improved thermal characteristics. Special selections of I_P (regulator current) are available for critical applications.

MAXIMUM RATINGS (T_L = 75°C)	SYMBOL		UNIT
Peak Operating Voltage	POV	50	V
Power Dissipation	P_D	800	mW
Operating and Storage Junction Temperature	T_J,T_{STG}	-65 to +200	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

TYPE NO.	REGULATOR CURRENT(1)			DYNAMIC IMPEDANCE	KNEE IMPEDANCE	LIMITING VOLTAGE	TEMPERATURE COEFFICIENT
	I_P @ V_T = 25V			Z_T @ V_T = 25V	Z_K @ V_K = 6.0V	V_L @ I_L = 0.8 I_P MIN	TC*
	mA			MΩ	kΩ	VOLTS	%/°C
	MIN	NOM	MAX	MIN	MIN	MAX	
CCLHM080	6.56	8.20	9.84	0.32	15	3.1	-0.25 to -0.45
CCLHM100	8.00	10.0	12.0	0.17	6.0	3.5	-0.25 to -0.45
CCLHM120	9.60	12.0	14.4	0.08	3.0	3.8	-0.25 to -0.45
CCLHM150	12.0	15.0	18.0	0.03	2.0	4.3	-0.25 to -0.45

(1) PULSED METHOD. PULSE WIDTH (ms) = $\frac{27.5}{\text{Ip NOM (mA)}}$

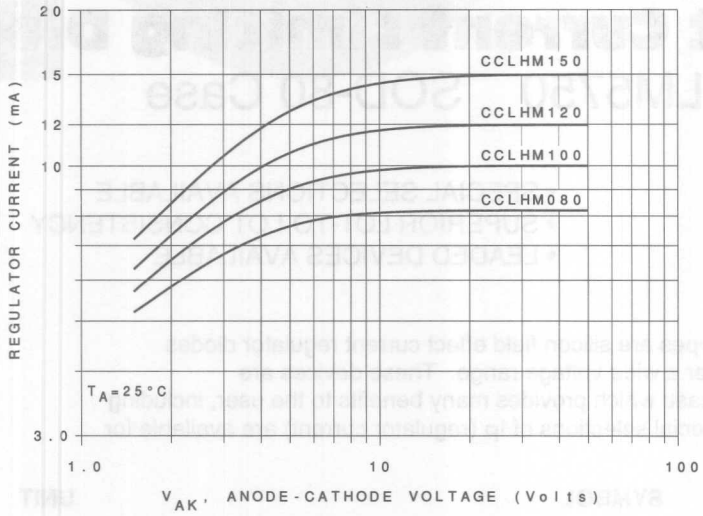
*The Temperature Coefficient is measured between the following points: +25°C and +50°C

MARKING CODES

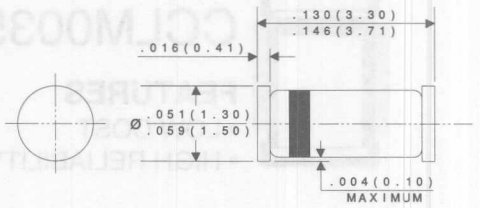
CENTRAL TYPE NO.	BAND 1*	BAND 2	BAND 3
CCLHM080	BLACK	GREEN	YELLOW
CCLHM100	BLACK	ORANGE	PINK
CCLHM120	BLACK	ORANGE	WHITE
CCLHM150	BLACK	ORANGE	LT. BLUE

*Cathode Band

Typical Regulator Current vs. Voltage

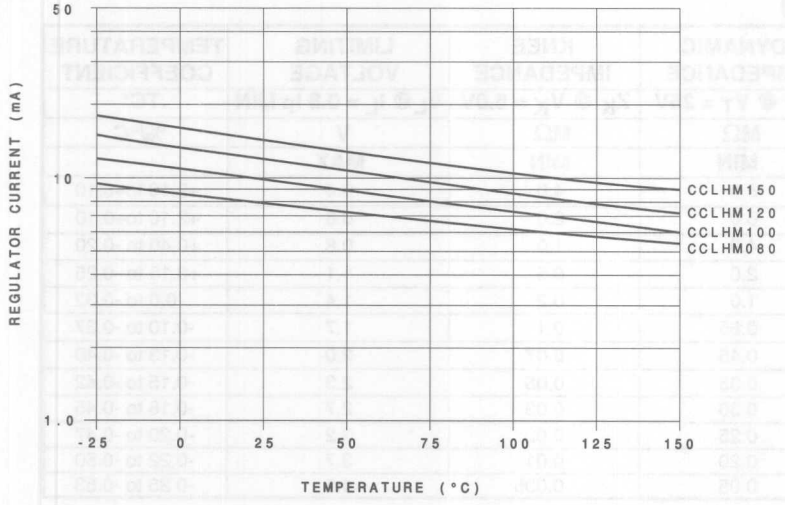


HERMETICALLY SEALED LEADLESS GLASS CASE



Dimensions in Inches (mm).

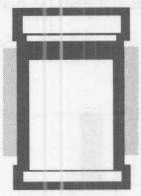
Typical Regulator Current vs. Temperature



Central™ Semiconductor Corp.

Surface Mount Current Limiting Diode

CCLM0035 Thru CCLM5750 SOD-80 Case



FEATURES

- LOW COST
- HIGH RELIABILITY
- SPECIAL SELECTIONS AVAILABLE
- SUPERIOR LOT-TO-LOT CONSISTENCY
- LEADED DEVICES AVAILABLE

DESCRIPTION

The CENTRAL SEMICONDUCTOR CCLM0035 series types are silicon field effect current regulator diodes designed for applications requiring a constant current over a wide voltage range. These devices are manufactured in the cost-effective SOD-80 double plug case which provides many benefits to the user, including space savings and improved thermal characteristics. Special selections of I_P (regulator current) are available for critical applications.

MAXIMUM RATINGS (T_L = 75°C)	SYMBOL		UNIT
Peak Operating Voltage	POV	100	V
Power Dissipation	P_D	800	mW
Operating and Storage Junction Temperature	T_J,T_{STG}	-65 to +200	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

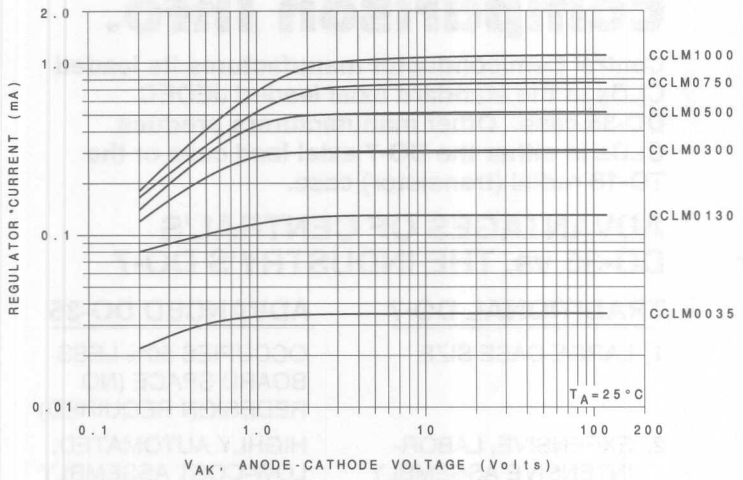
TYPE NO.	REGULATOR CURRENT(1)			DYNAMIC IMPEDANCE	KNEE IMPEDANCE	LIMITING VOLTAGE	TEMPERATURE COEFFICIENT
	I_P @ V_T = 25V			Z_T @ V_T = 25V	Z_K @ V_K = 6.0V	V_L @ I_L = 0.8 I_P MIN	TC*
	mA			MΩ	MΩ	V	%/°C
	MIN	NOM	MAX	MIN	MIN	MAX	
CCLM0035(2)	0.010	0.035	0.060	8.0	4.0	0.4	+2.10 to+0.10
CCLM0130	0.050	0.130	0.210	6.0	2.0	0.6	+2.10 to+0.10
CCLM0300	0.200	0.310	0.420	4.0	1.0	0.8	+0.40 to -0.20
CCLM0500	0.400	0.515	0.630	2.0	0.5	1.1	+0.15 to -0.25
CCLM0750	0.600	0.760	0.920	1.0	0.2	1.4	0.0 to -0.32
CCLM1000	0.880	1.100	1.320	0.65	0.1	1.7	-0.10 to -0.37
CCLM1500	1.280	1.500	1.720	0.45	0.07	2.0	-0.13 to -0.40
CCLM2000	1.680	2.000	2.320	0.35	0.05	2.3	-0.15 to -0.42
CCLM2700	2.280	2.690	3.100	0.30	0.03	2.7	-0.18 to -0.45
CCLM3500	3.000	3.550	4.100	0.25	0.02	3.2	-0.20 to -0.47
CCLM4500	3.900	4.500	5.100	0.20	0.01	3.7	-0.22 to -0.50
CCLM5750	5.000	5.750	6.500	0.05	0.005	4.5	-0.25 to -0.53

(1) PULSED METHOD. PULSE WIDTH (ms) = $\frac{27.5}{I_P \text{ NOM (mA)}}$

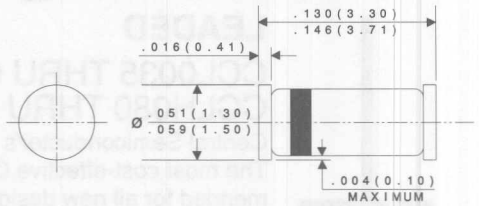
(2) Available on special order; please consult factory.

*The Temperature Coefficient is measured between the following points: +25°C and +50°C

Typical Regulator Current vs. Voltage

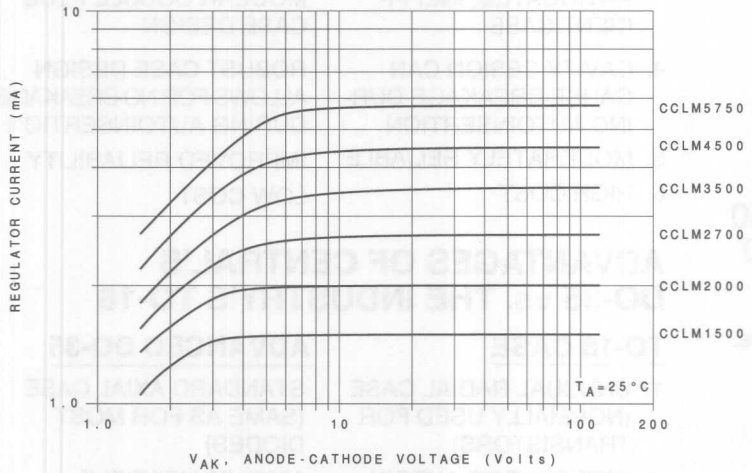


HERMETICALLY SEALED LEADLESS GLASS CASE



Dimensions in Inches (mm).

Typical Regulator Current vs. Voltage

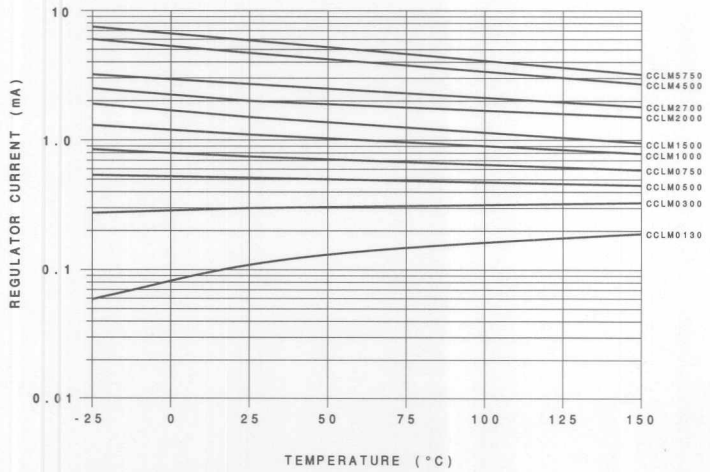


MARKING CODES

CENTRAL TYPE NO.	BAND 1*	BAND 2	BAND 3
CCLM0035	BLACK	LT. BLUE	WHITE
CCLM0130	BLACK	LT. BLUE	PINK
CCLM0300	BLACK	LT. BLUE	ORANGE
CCLM0500	BLACK	LT. BLUE	GREEN
CCLM0750	BLACK	LT. BLUE	DK. BLUE
CCLM1000	BLACK	GREEN	PINK
CCLM1500	BLACK	GREEN	ORANGE
CCLM2000	BLACK	GREEN	GREEN
CCLM2700	BLACK	GREEN	LT. BLUE
CCLM3500	BLACK	GREEN	DK. BLUE
CCLM4500	BLACK	GREEN	VIOLET
CCLM5750	BLACK	GREEN	WHITE

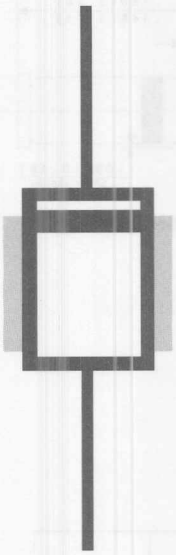
*Cathode Band

Typical Regulator Current vs. Temperature



Central™ Semiconductor Corp.

Central's Standard CLD Offering



LEADED

CCL0035 THRU CCL5750
CCLH080 THRU CCLH150

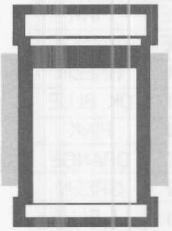
Central Semiconductor's in-house offering. The most cost-effective CLD series. Recommended for all new designs as well as replacements for the more expensive 1N5283 series. (SEE PAGES 6 & 8.)

1N5283 THRU 1N5314

Manufactured exactly to JEDEC specifications in the double plug, cavity-free DO-35 miniature case. (SEE PAGE 10.)

CMCL1300 THRU CMCL1304

Superior equivalent to Motorola MCL1300-MCL1304 series.



SURFACE MOUNT

CCLHM080 THRU CCLHM150
CCLM0035 THRU CCLM5750

Identical to the leaded CCL series except in the mini-melf (SOD-80) case. Power dissipation is 33% higher than leaded series. (SEE PAGES 12 & 14.)

Comparison Info.

Central Semiconductor manufactures its leaded CLDs in the standard axial leaded JEDEC DO-35 case. Other manufacturers produce CLDs in either the DO-7 axial lead case or the TO-18 radial (transistor) case.

ADVANTAGES OF CENTRAL'S DO-35 vs. THE INDUSTRY'S DO-7

	TRADITIONAL DO-7	ADVANCED DO-35
1.	LARGE CASE SIZE	OCCUPIES 50% LESS BOARD SPACE (NO REDESIGN REQUIRED)
2.	EXPENSIVE, LABOR-INTENSIVE ASSEMBLY PROCESS	HIGHLY AUTOMATED, LOW-COST ASSEMBLY PROCESS
3.	LOWER POWER DISSIPATION BECAUSE OF ANTIQUATED, INEFFICIENT CASE	HIGHER POWER DISSIPATION BECAUSE OF MODERN DOUBLE PLUG CASE DESIGN
4.	CAVITY DESIGN CAN CAUSE BREAKAGE DURING AUTOINSERTION	ROBUST CASE DESIGN ALLOWS FOR NO BREAKAGE DURING AUTOINSERTION
5.	MODERATELY RELIABLE	IMPROVED RELIABILITY
6.	HIGH COST	LOW COST

ADVANTAGES OF CENTRAL'S DO-35 vs. THE INDUSTRY'S TO-18

	TO-18 CASE	ADVANCED DO-35
1.	UNUSUAL RADIAL CASE (NORMALLY USED FOR TRANSISTORS)	STANDARD AXIAL CASE (SAME AS FOR MOST DIODES)
2.	DIFFICULT TO AUTOINSERT; MUST BE HAND-INSERTED	100% COMPATIBLE WITH ALL AUTOINSERT EQUIPMENT

CLD Application Notes

Connection Options

Series—Higher voltages may be obtained by connecting identical CLDs in series (Figure 4). Voltage balancing resistors are recommended. Since the resistors shunt the output resistance, their values should be high.

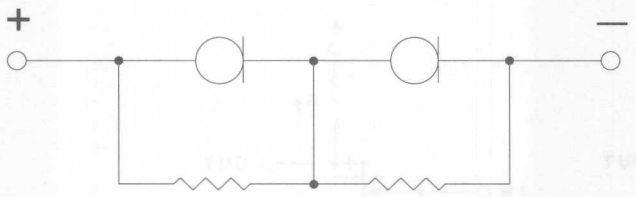


Figure 4. CLDs Connected in Series

Parallel—Increasing the current range may be accomplished by connecting CLDs in parallel (Figure 5). The resulting current is the sum of the individual currents. No special precautions are necessary.

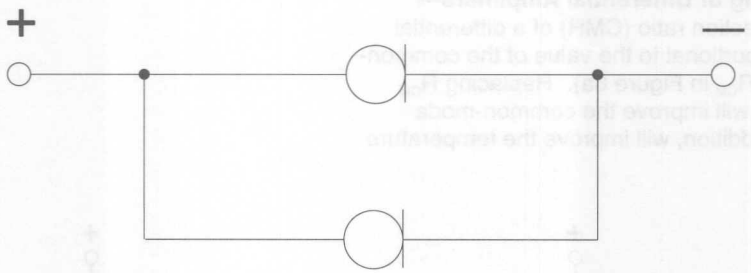


Figure 5. CLDs Connected in Parallel

Bidirectional—Two CLDs connected back-to-back make a useful AC clipper circuit which will regulate in either direction (Figure 6).

Figure 6. CLDs Connected Back-to-Back

Typical Applications

The CLD as a biasing, coupling and load resistor

Emitter/Source Biasing—The CLD can replace the usual emitter and source bias resistor (Figure 7), improving negative supply rejection.

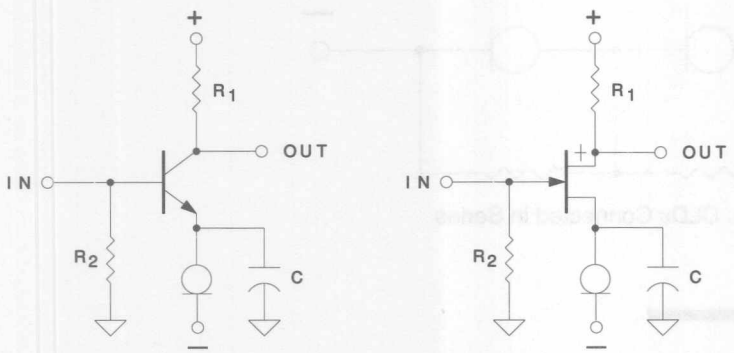


Figure 7. Emitter/Source Biasing

Common-Mode Biasing of Differential Amplifiers—The common-mode rejection ratio (CMR) of a differential amplifier is directly proportional to the value of the common-mode biasing resistor (R_{CM} in Figure 8a). Replacing R_{CM} with a CLD (Figure 8b) will improve the common-mode rejection ratio and, in addition, will improve the temperature stability.

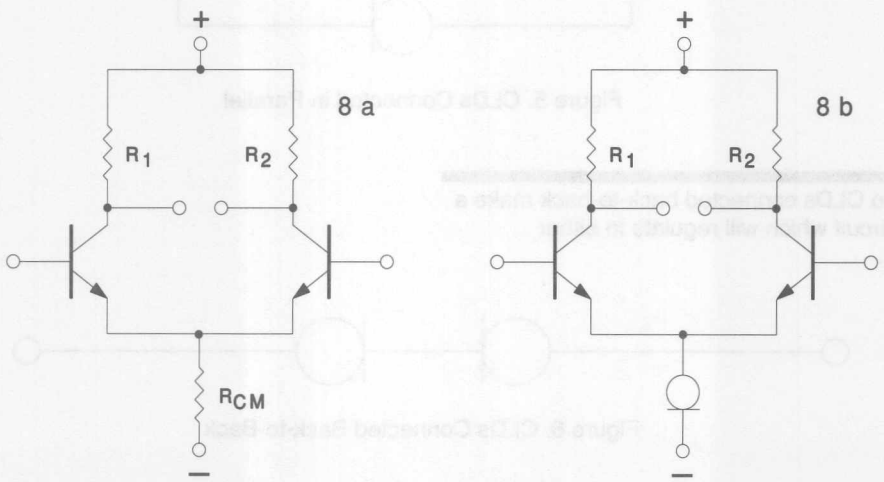


Figure 8. Common-Mode Biasing of Differential Amplifiers

Typical Applications *continued*

Biasing of Darlington Input Differential Amplifiers— The standard Darlington input differential amplifier can be improved two ways using CLDs. First, by improving the common-mode rejection ratio by replacing R_{CM} (Figure 9a) with CLD D_2 (Figure 9b). Secondly, adding CLDs D_1 and D_3 (Figure 9b) fixes the current in Q_1 and Q_4 , thereby eliminating the need to match the beta in transistor pairs Q_1-Q_2 and Q_3-Q_4. An additional benefit is the improved frequency response and reduced noise density.

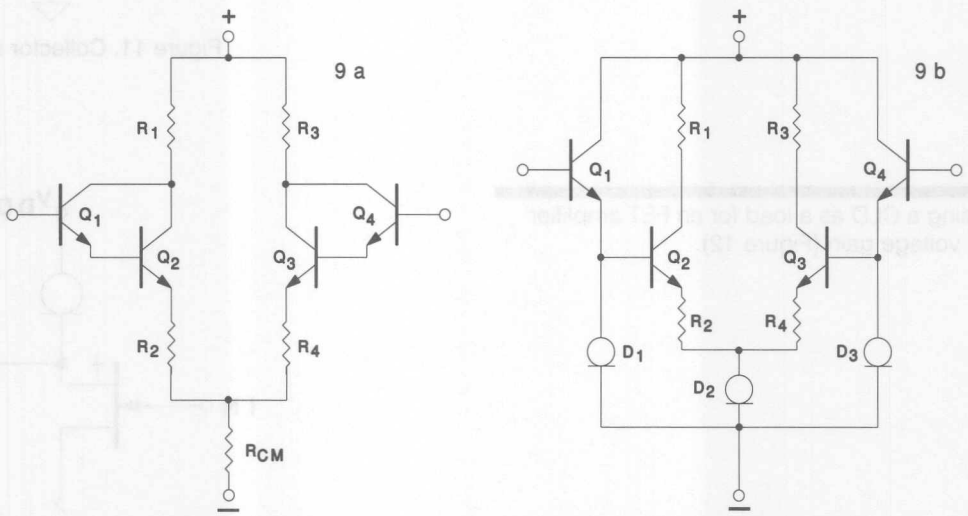


Figure 9. Biasing of Darlington Input Differential Amplifiers

DC Coupling—The loss in gain of a circuit using standard DC coupling (Figure 10a) can be greatly improved by replacing the coupling resistors R_2 and R_3 with a CLD and zener diode (Figure 10b).

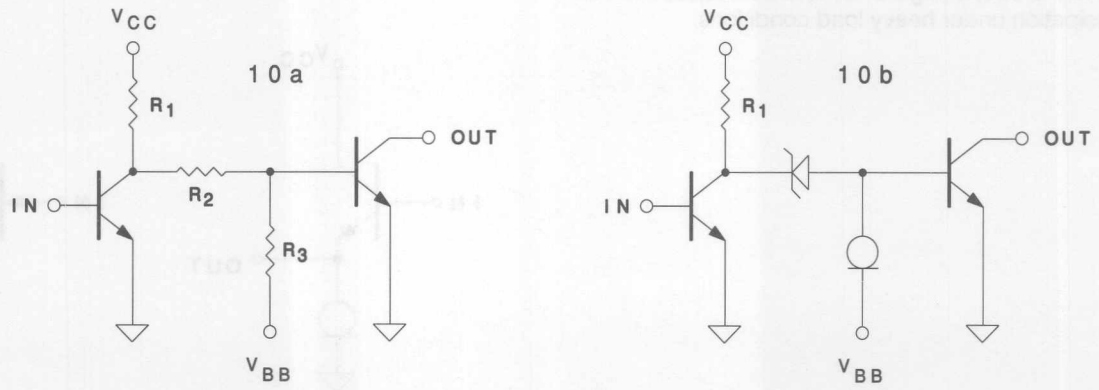


Figure 10. DC Coupling

Collector Load—The voltage gain of a common emitter amplifier can be increased five to ten times by replacing the collector load resistor with a CLD (Figure 11). To maintain this gain the amplifier must be lightly loaded (high Z load) and must be prevented from bottoming or switching off.

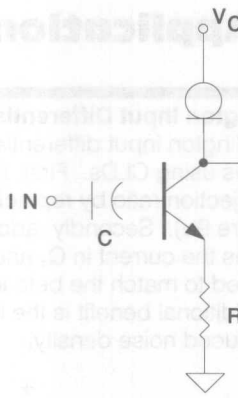


Figure 11. Collector Load

Drain Load—Using a CLD as a load for an FET amplifier will increase the voltage gain (Figure 12).

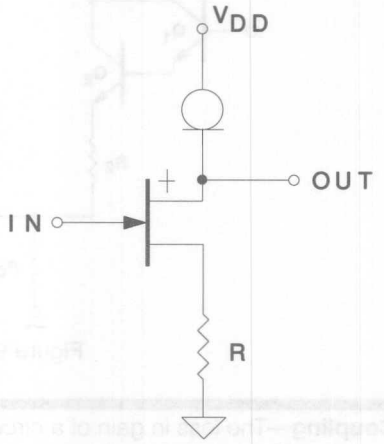


Figure 12. Drain Load

Emitter/Source Follower Load—Using a CLD as an emitter/source follower load increases the input impedance and gain of the circuit (Figure 13) and decreases the transistor dissipation under heavy load conditions.

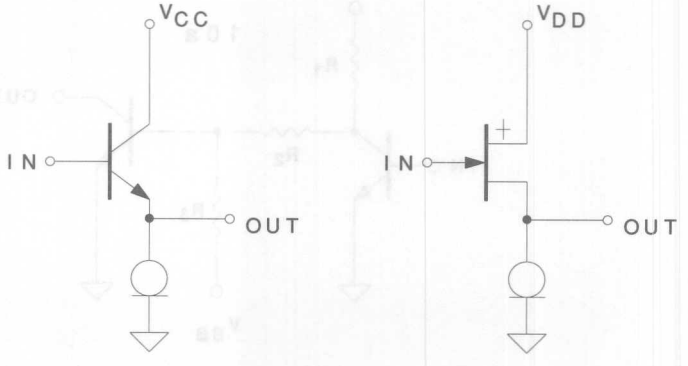


Figure 13. Emitter/Source Follower Load

Typical Applications *continued*

The CLD in Waveform Generators

Square-Wave Generator—A simple sine to square-wave generator can be built using two CLDs back-to-back, as shown in Figure 14.

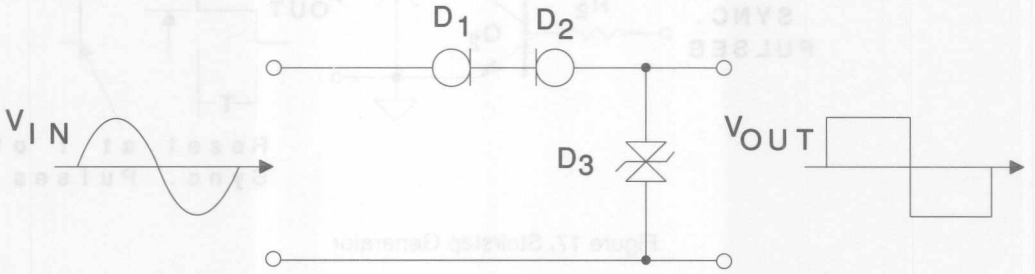


Figure 14. Square-Wave Generator

Triangle-Wave Generator—A simple sine or square to triangle-wave generator can be built using two CLDs back-to-back, as shown in Figure 15.

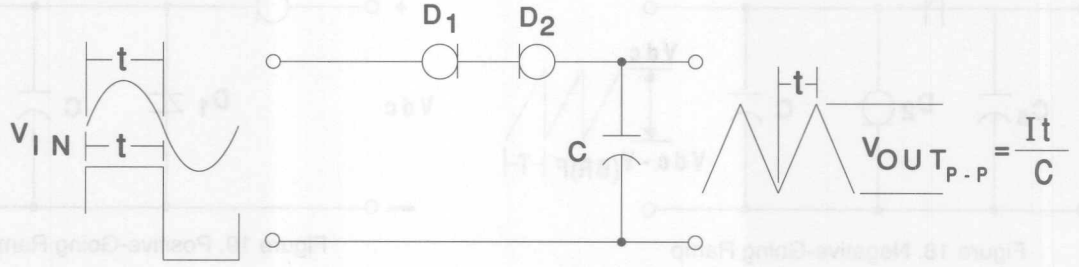


Figure 15. Triangle-Wave Generator

Stairstep Generator—A CLD is used to optimize the performance of a four-layer diode stairstep generator (Figure 16). The CLD allows the use of input pulses only a few volts above the breakdown voltage of the four-layer diode. Another stairstep generator (Figure 17, page 21) uses bipolar transistors and a CLD. This circuit requires that sync pulses be applied to Q_2 to reset the train of steps.

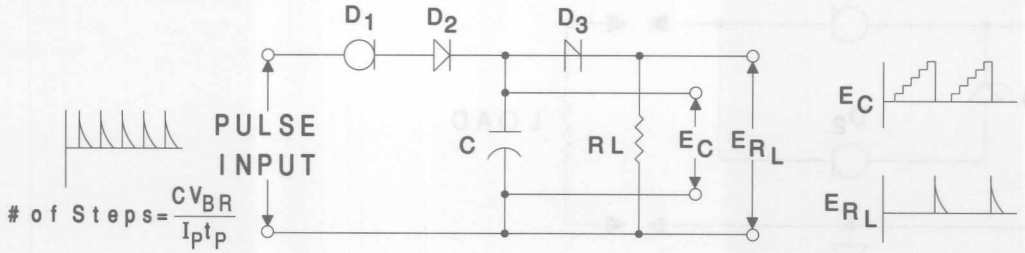


Figure 16. Stairstep Generator

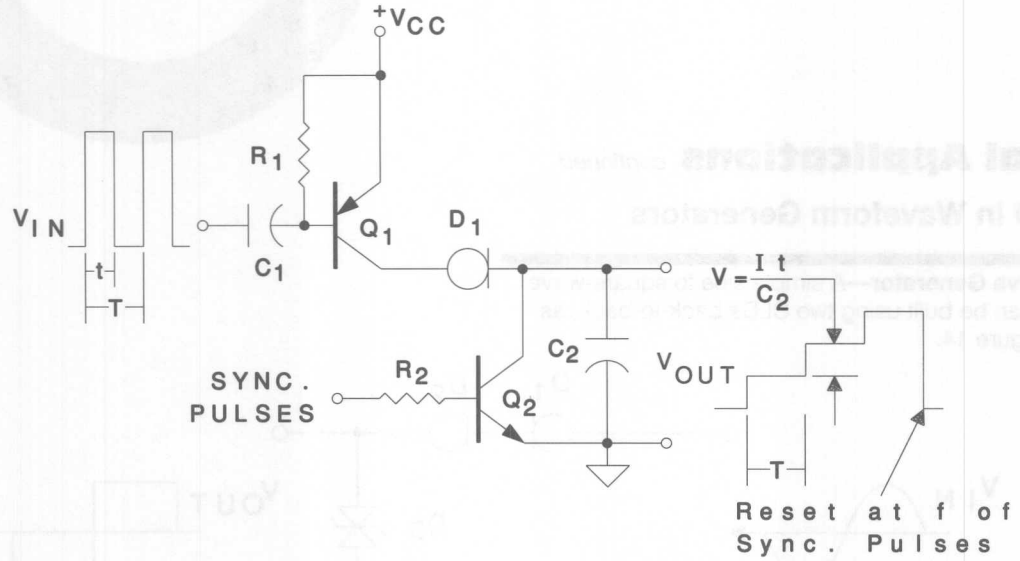


Figure 17. Stairstep Generator

Sawtooth Generator—The CLD can be used to produce a very linear sawtooth or ramp generator. The negative and positive going ramps are shown in figures 18 and 19, respectively.

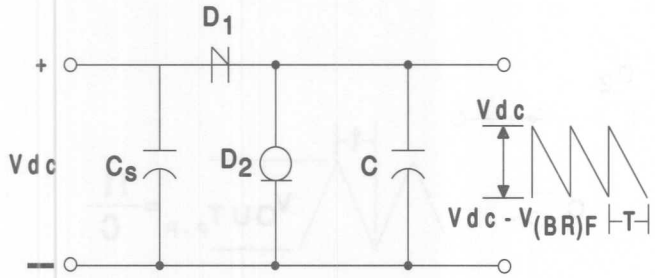


Figure 18. Negative-Going Ramp

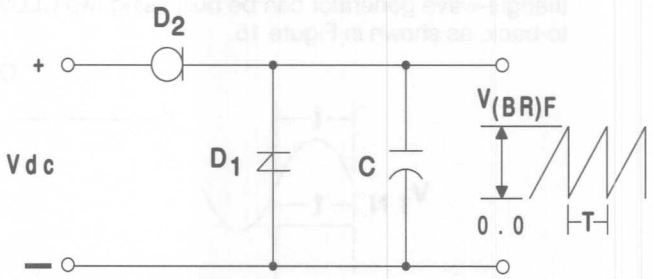


Figure 19. Positive-Going Ramp

Miscellaneous Applications

Two-Step Battery Charger—A pair of CLDs, along with a zener diode, provides for an excellent two-step battery charger, as shown in Figure 20.

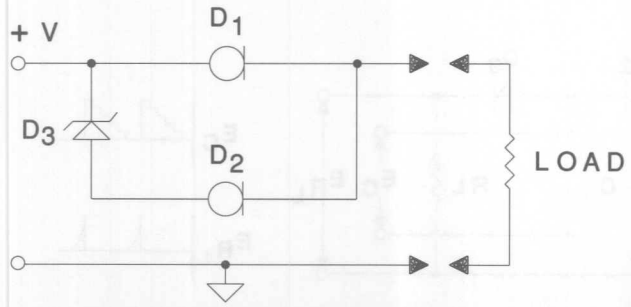


Figure 20. Two-Step Battery Charger

Miscellaneous Applications *continued*

Low Voltage/Low Noise Voltage Reference—The CLD can be used to produce a low voltage reference when operated to drive a known resistance (Figure 21). This circuit produces much lower noise than a standard low voltage reference designed with a zener diode. A low noise capacitor across R will further reduce noise.

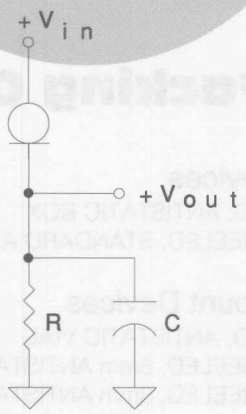


Figure 21. Low Voltage/Low Noise Voltage Reference

Voltage Reference with a Zener Diode—A CLD combined with a standard zener diode (Figure 22) produces an excellent voltage reference with the following advantages:

a) Variations of V_{in} have almost no effect on V_{out}, and V_{in} can be increased up to about 100 volts (the POV of the CLD) without concern about the dissipation of the zener diode.
b) Supply line noise and ripple is decoupled from the load by more than 100 dB to about 200 KHz.
C) The supply line is also decoupled from the load by more than 100 dB reducing the possibility of feedback due to common supply lines.

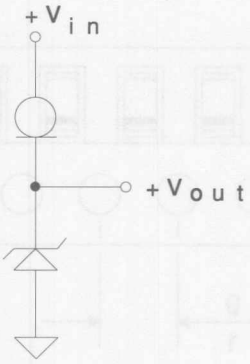


Figure 22. Voltage Reference with a Zener Source

Non-Destruct Fuse—The CLD can be used as a non-destruct fuse, limiting current to a safe value.

OTHER USEFUL APPLICATIONS AND NOTES

1) AC clipper circuit.
2) Constant current source for driving LEDs.
3) Current limiter for jell battery charger.
4) Improved speed and reduced power consumption in logic circuitry by active pull-up, as in a comparator.
5) Replacing holding coil in telephone connection devices.
6) Current source for biasing switching diodes.
7) Due to its positive temperature coefficient, the CCL0035 or the CCL0130 can be used for biasing a bipolar transistor to achieve constant gain over a temperature range.
8) Because of its nearly zero temperature coefficient, the CCL0750 is ideal for certain applications.

CLD Packing Options

Leaded Devices

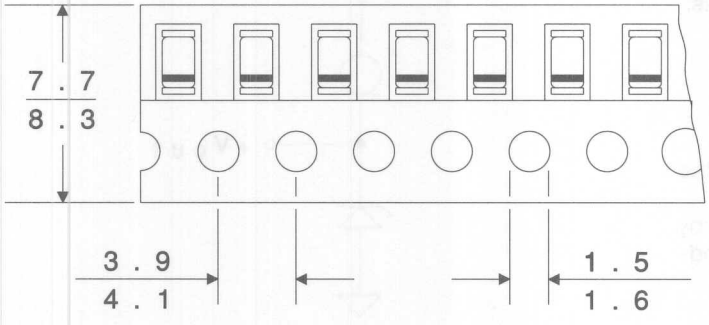
BULK PACKED, ANTISTATIC BOX	2,500/BOX	ADD BK SUFFIX
TAPED AND REELED, STANDARD AXIAL	2,500/REEL	ADD TR SUFFIX

Surface Mount Devices

BULK PACKED, ANTISTATIC VIAL	1,000/VIAL	ADD BK SUFFIX
TAPED AND REELED, 8mm ANTISTATIC, 7" REEL	2,500/REEL	ADD TR SUFFIX
TAPED AND REELED, 8mm ANTISTATIC, 13" REEL	10,000/REEL	ADD TR13 SUFFIX

Tape Dimensions and Orientation for Surface Mount

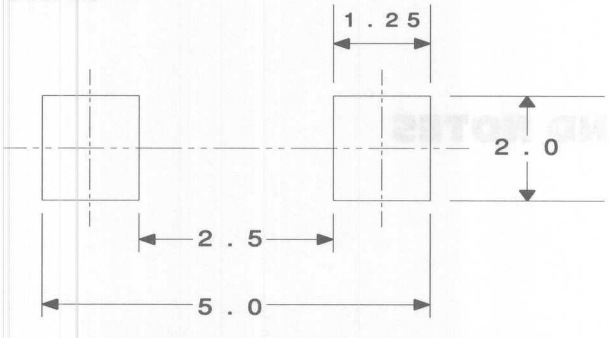
SOD-80



(Dimensions in mm)

Mounting Pad Geometry for Surface Mount

SOD-80



(Dimensions in mm)

Rectifiers

1.0 to 250 Amperes
50 to 1600 Volts

I_O (AMPS)	1.0				
@ T_A (°C)	75	75	75	55	100
I_{FSM} (AMPS)	30	50	50	50	50
CASE	 GPR-1A	 DO-41*		 GPR-1A	 DO-41 Glass
V_{RRM} (VOLTS)					
50		1N4001	1N4001GPP**		
100		1N4002	1N4002GPP**		
200	1N3611	1N4003	1N4003GPP**	1N4245	1N4383
400	1N3612	1N4004	1N4004GPP**	1N4246	1N4384
600	1N3613	1N4005	1N4005GPP**	1N4247	1N4385
800	1N3614	1N4006	1N4006GPP**	1N4248	1N4585
1000	1N3957	1N4007	1N4007GPP**	1N4249	1N4586

V_F MAX @ $I_F = I_O$	1.1V	1.1V	1.1V	1.2V	1.1V

I_R MAX @ V_{RRM}	1.0μA	5.0μA	5.0μA	1.0μA	10μA

* Also available in DO-41SP Case (0.6mm lead diameter) with Radial Tape and Reel (DO-41SP-RPCU). See page 239.

** Device utilizes glass passivated chip for high reliability.

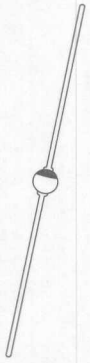
Rectifiers, General Purpose
(Continued)

I_O (AMPS)	1.0			1.5	
@ T_A (°C)	75	55	75	70	75
I_{FSM} (AMPS)	50	50	50	50	50
CASE	GPR-1A			DO-15†	DO-41*
V_{RRM} (VOLTS)					
50				1N5391†	
100			CPR1-010	1N5392†	CR1-010
200	1N5059	1N5614	CPR1-020	1N5393†	CR1-020
300				1N5394†	
400	1N5060	1N5616	CPR1-040	1N5395†	CR1-040
500				1N5396†	
600	1N5061	1N5618	CPR1-060	1N5397†	CR1-060
800	1N5062	1N5620	CPR1-080	1N5398†	CR1-080
1000		1N5622	CPR1-100	1N5399†	CR1-100
1200			CPR1-120		CR1-120
V_F MAX @ $I_F = I_O$	1.2V	1.2V	1.1V	1.4V	1.1V
I_R MAX @ V_{RRM}	5.0μA	0.5μA	5.0μA	10μA	5.0μA

* Also available in DO-41SP Case (0.6mm lead diameter) with Radial Tape and Reel (DO-41SP-RPCU). See page 239.

† Available in DO-41 case on special order--just add DO-41 suffix to part number. Ex: 1N5395 DO-41

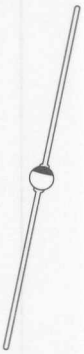
Rectifiers, General Purpose
(Continued)

I_O (AMPS)	2.0		3.0		
@ T_A (°C)	75	50	75	55	75
I_{FSM} (AMPS)	50	50	200	100	125
CASE	 GPR-1A	 DO-15	 DO-201AD	 GPR-3A	
V_{RRM} (VOLTS)					
50			1N5400		
100	CPR2-010	CR2-010	1N5401		
200	CPR2-020	CR2-020	1N5402	1N5550	1N5624
300			IN5403		
400	CPR2-040	CR2-040	1N5404	1N5551	1N5625
500			1N5405		
600	CPR2-060	CR2-060	1N5406	1N5552	1N5626
800	CPR2-080	CR2-080	1N5407	1N5553	1N5627
1000	CPR2-100	CR2-100	1N5408	1N5554	
1200	CPR2-120	CR2-120			
1400		CR2-140			
1600		CR2-160			

V_F MAX @ $I_F = I_O$	1.2V	1.1V	1.1V	1.1V	1.0V

I_R MAX @ V_{RRM}	5.0μA	10μA	10μA	1.0μA	5.0μA

Rectifiers, General Purpose
(Continued)

I_O (AMPS)	3.0			5.0	6.0
@ T_A (°C)	75	100	75	75	60
I_{FSM} (AMPS)	125	200	200	200	400
CASE	 GPR-3A	 DO-201AD			 CASE 106
V_{RRM} (VOLTS)					
50		CR3-005	CR3-005GPP*		
100	CPR3-010	CR3-010	CR3-010GPP*	CR5-010	
200	CPR3-020	CR3-020	CR3-020GPP*	CR5-020	CR6A2GPP*
400	CPR3-040	CR3-040	CR3-040GPP*	CR5-040	CR6A4GPP*
600	CPR3-060	CR3-060	CR3-060GPP*	CR5-060	CR6A6GPP*
800	CPR3-080	CR3-080	CR3-080GPP*	CR5-080	CR6A8GPP*
1000	CPR3-100	CR3-100	CR3-100GPP*	CR5-100	CR6A10GPP*
1200		CR3-120			

V_F MAX @ $I_F = I_O$	1.1V	1.1V	1.1V	1.2V	1.0V

I_R MAX @ V_{RRM}	5.0μA	10μA	5.0μA	5.0μA	10μA

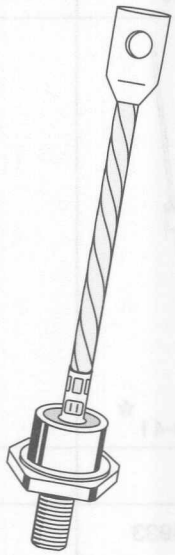
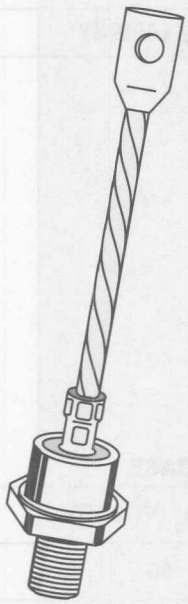
* Device utilizes glass pasivated chip for high reliability.

Rectifiers, General Purpose
(Continued)

I_O (AMPS)	12	16	20	40
@ T_C (°C)	150	150	150	150
I_{FSM} (AMPS)	300	325	350	800
CASE	DO-4 *			DO-5 *
V_{RRM} (VOLTS)				
100	CR12-010	CR16-010	CR20-010	CR40-010
200	CR12-020	CR16-020	CR20-020	CR40-020
400	CR12-040	CR16-040	CR20-040	CR40-040
600	CR12-060	CR16-060	CR20-060	CR40-060
800	CR12-080	CR16-080	CR20-080	CR40-080
1000	CR12-100	CR16-100	CR20-100	CR40-100
1200	CR12-120	CR16-120	CR20-120	CR40-120
V_F MAX @ $I_F = I_O$	1.1V	1.1V	1.1V	1.1V
I_R MAX @ V_{RRM}	10μA	10μA	10μA	100μA

* Standard polarity is cathode to case. For reverse polarity add "R" suffix to part number.

Rectifiers, General Purpose
(Continued)

I_O (AMPS)	60	80	150	250
@ T_C (°C)	150	150	150	150
I_{FSM} (AMPS)	900	1500	3000	5000
CASE	 DO-5 *		 DO-8 *	 DO-9 *
V_{RRM} (VOLTS)				
100	CR60-010	CR80-010	CR150-010	CR250-010
200	CR60-020	CR80-020	CR150-020	CR250-020
400	CR60-040	CR80-040	CR150-040	CR250-040
600	CR60-060	CR80-060	CR150-060	CR250-060
800	CR60-080	CR80-080	CR150-080	CR250-080
1000	CR60-100	CR80-100	CR150-100	CR250-100
1200	CR60-120	CR80-120	CR150-120	CR250-120

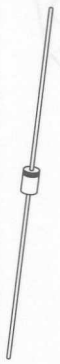
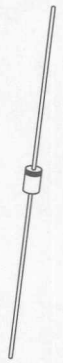
V_F MAX @ $I_F = I_O$	1.1V	1.2V	1.1V	1.1V

I_R MAX @ V_{RRM}	100μA	100μA	1.0mA	2.0mA

* Standard polarity is cathode to case. For reverse polarity add "R" suffix to part number.

Rectifiers, Fast Recovery

1.0 to 6.0 Amperes
50 to 1200 Volts

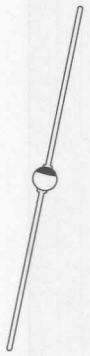
I_O (AMPS)	1.0				
@ T_A (°C)	75	55	55	75	80
I_{FSM} (AMPS)	30	50	50	50	50
CASE	 DO-41*	 GPR-1A			 DO-41*
V_{RRM} (VOLTS)					
50	1N4933				
100	1N4934			CPR1F-010	CR1F-010
200	1N4935	1N4942	1N5615	CPR1F-020	CR1F-020
400	1N4936	1N4944	1N5617	CPR1F-040	CR1F-040
600	1N4937	1N4946	1N5619	CPR1F-060	CR1F-060
800		1N4947	1N5621	CPR1F-080	CR1F-080
1000		1N4948	1N5623	CPR1F-100	CR1F-100
1200					CR1F-120

V_F MAX @ $I_F = I_O$	1.2V	1.3V	1.2V	1.3V	1.2V

I_R MAX @ V_{RRM}	5.0μA	1.0μA	0.5μA	5.0μA	5.0μA
t_{rr} (50V thru 400V)	200ns	150ns	150ns	200ns	150ns
t_{rr} (600V)	200ns	250ns	250ns	200ns	150ns
t_{rr} (800V)		250ns	300ns	300ns	500ns
t_{rr} (1000V)		500ns	500ns	500ns	500ns
t_{rr} (1200V)					500ns

* Also available in DO-41SP Case (0.6mm lead diameter) with Radial Tape and Reel (DO-41SP-RPCU). See page 239.

Rectifiers, Fast Recovery
(Continued)

I_O (AMPS)	2.0		3.0	
@ T_A (°C)	75	75	55	55
I_{FSM} (AMPS)	50	50	80	80
CASE	 GPR-1A	 DO-15	 GPR-3A	
V_{RRM} (VOLTS)				
50			1N5185	1N5415
100	CPR2F-010	CR2F-010	1N5186	1N5416
200	CPR2F-020	CR2F-020	1N5187	1N5417
400	CPR2F-040	CR2F-040	1N5188	1N5418
600	CPR2F-060	CR2F-060	1N5190	1N5420
800	CPR2F-080	CR2F-080		
1000	CPR2F-100	CR2F-100		

V_F MAX @ $I_F = I_O$	1.3V	1.3V	1.3V	1.1V

I_R MAX @ V_{RRM}	5.0μA	5.0μA	5.0μA	1.0μA
t_{rr} (50V thru 400V)	200ns	200ns	300ns	150ns
t_{rr} (600V)	250ns	250ns	400ns	400ns
t_{rr} (800V)	500ns	500ns		
t_{rr} (1000V)	500ns	500ns		

Rectifiers, Fast Recovery
(Continued)

I_O (AMPS)	3.0		5.0	6.0
@ T_A (°C)	75	80	80	60
I_{FSM} (AMPS)	100	100	125	300
CASE	 GPR-3A	 DO-201AD		 CASE 106
V_{RRM} (VOLTS)				
100	CPR3F-010	CR3F-010	CR5F-010	CR6AF1GPP*
200	CPR3F-020	CR3F-020	CR5F-020	CR6AF2GPP*
400	CPR3F-040	CR3F-040	CR5F-040	CR6AF4GPP*
600	CPR3F-060	CR3F-060	CR5F-060	CR6AF6GPP*
800	CPR3F-080	CR3F-080	CR5F-080	CR6AF8GPP*
1000	CPR3F-100	CR3F-100	CR5F-100	CR6AF10GPP*

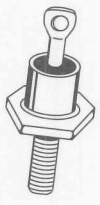
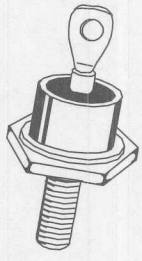
V_F MAX @ $I_F = I_O$	1.3V	1.3V	1.3V	1.2V

I_R MAX @ V_{RRM}	5.0μA	5.0μA	5.0μA	10μA
t_{rr} (100V thru 400V)	250ns	250ns	250ns	200ns
t_{rr} (600V)	250ns	250ns	250ns	250ns
t_{rr} (800V)	400ns	400ns	400ns	500ns
t_{rr} (1000V)	500ns	500ns	500ns	500ns

* Device utilizes glass passivated chip for high reliability.

Rectifiers, Ultra Fast

1.0 to 70 Amperes
50 to 1000 Volts

I_O (AMPS)	1.0	3.0	5.0	30	70
@ T_A (°C)	75	55	55		
@ T_C (°C)				120	120
I_{FSM} (AMPS)	30	150	175	300	700
CASE	 DO-41*	 DO-201AD		 DO-4**	 DO-5**
V_{RRM} (VOLTS)					
50	UF4001				
100	UF4002	CR3U-010	CR5U-010	CR30U-010	CR70U-010
200	UF4003	CR3U-020	CR5U-020	CR30U-020	CR70U-020
400	UF4004	CR3U-040	CR5U-040	CR30U-040	CR70U-040
600	UF4005	CR3U-060	CR5U-060	CR30U-060	CR70U-060
800	UF4006	CR3U-080	CR5U-080	CR30U-080	CR70U-080
1000	UF4007	CR3U-100	CR5U-100		

V_F MAX @ $I_F = I_O$					
(50V thru 200V)	1.0V	1.0V	1.0V	0.975V	0.975V
(400V)	1.0V	1.3V	1.3V	1.2V	1.2V
(600V thru 1000V)	1.7V	1.7V	1.7V	1.3V	1.3V

I_R MAX @ V_{RRM}	10μA	10μA	10μA	25μA	25μA
t_{rr} (50V thru 200V)	50ns	50ns	50ns	35ns	50ns
t_{rr} (400V)	50ns	50ns	50ns	50ns	75ns
t_{rr} (600V thru 1000V)	75ns	75ns	100ns	75ns	100ns

* Also available in DO-41SP Case (0.6mm lead diameter) with Radial Tape and Reel (DO-41SP-RPCU). See page 239.

** Standard polarity is cathode to case. For reverse polarity add "R" suffix to part number.

Schottky Rectifiers

1.0 to 75 Amperes
20 to 60 Volts

I_O (AMPS)	1.0		2.0	3.0
@ T_A (°C)	25	25	25	25
I_{FSM} (AMPS)	25	50	75	80
CASE	 DO-41 *		 DO-15	 DO-201AD
V_{RRM} (VOLTS)				
20	1N5817	CRSH1-2	CRSH2-2	1N5820
30	1N5818	CRSH1-3	CRSH2-3	1N5821
40	1N5819	CRSH1-4	CRSH2-4	1N5822
50		CRSH1-5	CRSH2-5	
60		CRSH1-6		

V_F MAX @ $I_F = I_O$				
20V	0.45V MAX @ 1.0A	0.50V MAX @ 1.0A	0.55V MAX @ 2.0A	0.475V MAX @ 3.0A
30V	0.55V MAX @ 1.0A	0.50V MAX @ 1.0A	0.55V MAX @ 2.0A	0.500V MAX @ 3.0A
40V	0.60V MAX @ 1.0A	0.50V MAX @ 1.0A	0.55V MAX @ 2.0A	0.525V MAX @ 3.0A
50V		0.70V MAX @ 1.0A	0.55V MAX @ 2.0A	
60V		0.70V MAX @ 1.0A		

I_R MAX @ V_{RRM}	1.0mA	1.0mA	1.0mA	2.0mA

* Also available in DO-41SP Case (0.6mm lead diameter) with Radial Tape and Reel (DO-41SP-RPCU). See page 239.

Schottky Rectifiers
(Continued)

I_O (AMPS)	3.0	5.0		8.0
@ T_A (°C)	25	25	25	25
I_{FSM} (AMPS)	100	250	250	250
CASE	 DO-201AD			
V_{RRM} (VOLTS)				
20	CRSH3-2	CN5823	CRSH5-2	CRSH8A-2
30	CRSH3-3	CN5824	CRSH5-3	CRSH8A-3
40	CRSH3-4	CN5825	CRSH5-4	CRSH8A-4
50	CRSH3-5		CRSH5-5	
60	CRSH3-6		CRSH5-6	

V_F MAX @ $I_F = I_O$				
20V	0.50V MAX @ 3.0A	0.45V MAX @ 5.0A	0.57V MAX @ 5.0A	0.55V MAX @8.0A
30V	0.50V MAX @ 3.0A	0.45V MAX @ 5.0A	0.57V MAX @ 5.0A	0.55V MAX @ 8.0A
40V	0.50V MAX @ 3.0A	0.45V MAX @ 5.0A	0.57V MAX @ 5.0A	0.55V MAX @8.0A
50V	0.75V MAX @ 3.0A		0.70V MAX @ 5.0A	
60V	0.75V MAX @ 3.0A		0.70V MAX @ 5.0A	

I_R MAX @ V_{RRM}	3.0mA	10mA	10mA	10mA

Schottky Rectifiers
(Continued)

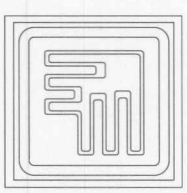
I_O (AMPS)	25	30	75
@ T_C (°C)	150	150	120
I_{FSM} (AMPS)	600	600	1200
CASE	 DO-4 *		 DO-5 *
V_{RRM} (VOLTS)			
20	CRSH25-2		
30	CRSH25-3	CRSH30-3	CRSH75-3
40	CRSH25-4	CRSH30-4	CRSH75-4
50		CRSH30-5	CRSH75-5

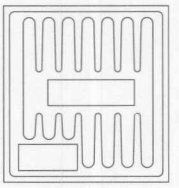
V_F MAX @ $I_F = I_O$			
20V	0.58V MAX @ 25A		
30V	0.58V MAX @ 25A	0.63V MAX @ 30A	0.70V MAX @ 75A
40V	0.58V MAX @ 25A	0.63V MAX @ 30A	0.70V MAX @ 75A
50V		0.63V MAX @ 30A	0.70V MAX @ 75A

I_R MAX @ V_{RRM}	2.0mA	2.0mA	2.0mA

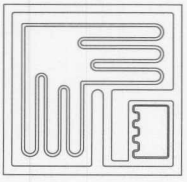
* Standard polarity is cathode to case. For reverse polarity add "R" suffix to part number.

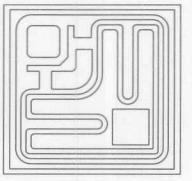
Devices Are Now Available In Chip Form For Hybrid Applications





- Zener Diodes
- Switching Diodes
- Schottky Rectifiers
- Silicon Power Rectifiers
- Small Signal Transistors
- Bipolar Power Transistors





Over 30 different geometries available!

Please contact our sales department for more details or a copy of our latest chip brochure.

Central™ Semiconductor Corp.

Bridge Rectifiers

Bridge Rectifiers, General Purpose

Single Phase, Full Wave

1.0 to 35 Amperes
100 to 1000 Volts

I_O (AMPS)	1.0			1.5		2.0
@ T_A (°C)	50	50	75	50	50	55
@ T_C (°C)						
I_{FSM} (AMPS)	50	50	30	50	50	60
CASE	DIP	SMDIP	CASE B-M	CASE A	CASE B-M	CASE A
V_{RRM} (VOLTS)						
100	CBR1-D010		3N247-M	CBR1-010	CBR1-L010M	CBR2-010
200	CBR1-D020	CBR1-D020S	3N248-M	CBR1-020	CBR1-L020M	CBR2-020
400	CBR1-D040	CBR1-D040S	3N249-M	CBR1-040	CBR1-L040M	CBR2-040
600	CBR1-D060	CBR1-D060S	3N250-M	CBR1-060	CBR1-L060M	CBR2-060
800	CBR1-D080		3N251-M	CBR1-080	CBR1-L080M	CBR2-080
1000	CBR1-D100	CBR1-D100S	3N252-M	CBR1-100	CBR1-L100M	CBR2-100

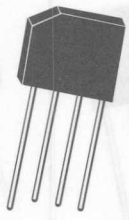
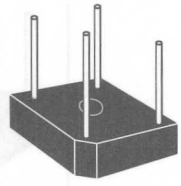
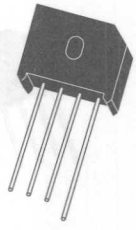
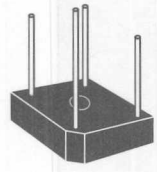
V_F MAX @ I_F	1.1V @ 1.0A	1.1V @ 1.0A	1.3V @ 3.14A	1.0V @1.0A	1.0V @1.0A	1.1V @ 2.0A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA	10μA	10μA

Bridge Rectifiers, General Purpose
(Continued)

I_O (AMPS)	2.0		3.0	4.0		6.0
@ T_A (°C)	55	55	2.0 @ 25	50	4.0 @ 25	50
@ T_C (°C)			3.0 @ 50		8.0 @ 100	100
I_{FSM} (AMPS)	60	55	50	200	300	150
CASE	CASE B-M		CASE C	CASE D	CASE DM	CASE CM
V_{RRM} (VOLTS)						
100	CBR 2-L010M	3N254-M	CBR 3-P010	CBR 4-L010	CBR 4M-L010	CBR 6-010
200	CBR 2-L020M	3N255-M	CBR 3-P020	CBR 4-L020	CBR 4M-L020	CBR 6-020
400	CBR 2-L040M	3N256-M	CBR 3-P040	CBR 4-L040	CBR 4M-L040	CBR 6-040
600	CBR 2-L060M	3N257-M	CBR 3-P060	CBR 4-L060	CBR 4M-L060	CBR 6-060
800	CBR 2-L080M	3N258-M	CBR 3-P080	CBR 4-L080	CBR 4M-L080	CBR 6-080
1000	CBR 2-L100M	3N259-M	CBR 3-P100	CBR 4-L100	CBR 4M-L100	CBR 6-100

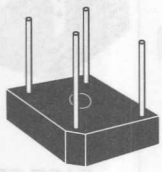
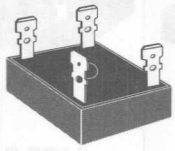
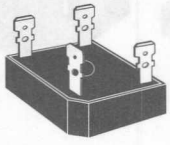
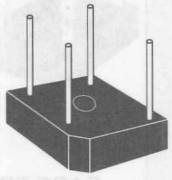
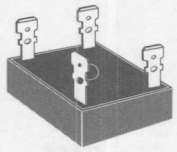
V_F MAX @ I_F	1.1V @ 2.0A	1.1V @ 3.14A	1.1V @ 1.5A	1.1V @ 3.0A	1.1V @ 6.28A	1.1V @ 3.0A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA	10μA	10μA

Bridge Rectifiers, General Purpose
(Continued)

I_O (AMPS)	6.0		8.0		10
@ T_A (°C)	50	50	50	50	
@ T_C (°C)		100	100	100	100
I_{FSM} (AMPS)	200	250	125	300	150
CASE	 CASE D	 CASE DM	 CASE E	 CASE DM	 CASE CM
V_{RRM} (VOLTS)					
100	CBR 6-L010	CBR 6M-L010	CBR 8-010	CBR 8M-L010	CBR10-J010
200	CBR 6-L020	CBR 6M-L020	CBR 8-020	CBR 8M-L020	CBR10-J020
400	CBR 6-L040	CBR 6M-L040	CBR 8-040	CBR 8M-L040	CBR10-J040
600	CBR 6-L060	CBR 6M-L060	CBR 8-060	CBR 8M-L060	CBR10-J060
800	CBR 6-L080	CBR 6M-L080	CBR 8-080	CBR 8M-L080	CBR10-J080
1000	CBR 6-L100	CBR 6M-L100	CBR 8-100	CBR 8M-L100	CBR10-J100

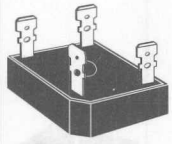
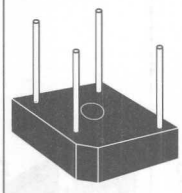
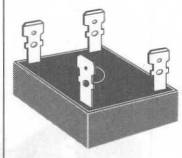
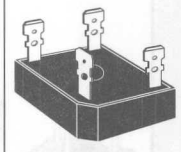
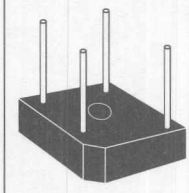
V_F MAX @ I_F	1.1V @ 3.0A	1.0V @ 6.0A	1.1V @ 4.0A	1.0V @ 8.0A	1.2V @ 5.0A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA	10μA

Bridge Rectifiers, General Purpose
(Continued)

I_O (AMPS)	10				25
@ T_A (°C)					
@ T_C (°C)	80	60	60	60	60
I_{FSM} (AMPS)	150	300	300	300	350
CASE	 CASE E	 CASE F	 CASE FP	 CASE FPW	 CASE F
V_{RRM} (VOLTS)					
100	CBR10-P010	CBR10-010	CBR10-010P	CBR10-010PW	CBR25-010
200	CBR10-P020	CBR10-020	CBR10-020P	CBR10-020PW	CBR25-020
400	CBR10-P040	CBR10-040	CBR10-040P	CBR10-040PW	CBR25-040
600	CBR10-P060	CBR10-060	CBR10-060P	CBR10-060PW	CBR25-060
800	CBR10-P080	CBR10-080	CBR10-080P	CBR10-080PW	CBR25-080
1000	CBR10-P100	CBR10-100	CBR10-100P	CBR10-100PW	CBR25-100

V_F MAX @ I_F	1.2V @ 5.0A	1.2V @ 5.0A	1.2V @ 5.0A	1.2V @ 5.0A	1.2V @ 12.5A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA	10μA

Bridge Rectifiers, General Purpose
(Continued)

I_O (AMPS)	25		35		
@ T_A (°C)					
@ T_C (°C)	60	60	60	60	60
I_{FSM} (AMPS)	350	350	400	400	400
CASE	 CASE FP	 CASE FPW	 CASE F	 CASE FP	 CASE FPW
V_{RRM} (VOLTS)					
100	CBR25-010P	CBR25-010PW	CBR35-010	CBR35-010P	CBR35-010PW
200	CBR25-020P	CBR25-020PW	CBR35-020	CBR35-020P	CBR35-020PW
400	CBR25-040P	CBR25-040PW	CBR35-040	CBR35-040P	CBR35-040PW
600	CBR25-060P	CBR25-060PW	CBR35-060	CBR35-060P	CBR35-060PW
800	CBR25-080P	CBR25-080PW	CBR35-080	CBR35-080P	CBR35-080PW
1000	CBR25-100P	CBR25-100PW	CBR35-100	CBR35-100P	CBR35-100PW

V_F MAX @ I_F	1.2V @ 12.5A	1.2V @ 12.5A	1.2V @ 17.5A	1.2V @ 17.5A	1.2V @ 17.5A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA	10μA

Bridge Rectifiers, Fast Recovery

Single Phase, Full Wave

1.0 to 35 Amperes
100 to 1000 Volts

I_O (AMPS)	1.0		1.5	2.0	3.0
@ T_A (°C)	50	50	50	55	2.0 @ 25
@ T_C (°C)					3.0 @ 50
I_{FSM} (AMPS)	50	50	50	60	50
CASE	DIP	SMDIP	CASE A		CASE C
V_{RRM} (VOLTS)					
100	CBR 1F-D010		CBR 1F-010	CBR 2F-010	CBR 3F-P010
200	CBR 1F-D020	CBR 1F-D020S	CBR 1F-020	CBR 2F-020	CBR 3F-P020
400	CBR 1F-D040	CBR 1F-D040S	CBR 1F-040	CBR 2F-040	CBR 3F-P040
600	CBR 1F-D060	CBR 1F-D060S	CBR 1F-060	CBR 2F-060	CBR 3F-P060
800	CBR 1F-D080		CBR 1F-080	CBR 2F-080	CBR 3F-P080
1000	CBR 1F-D100	CBR 1F-D100S	CBR 1F-100	CBR 2F-100	CBR 3F-P100

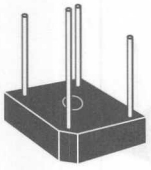
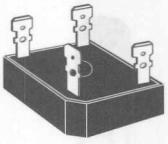
V_F MAX @ I_F	1.3V @ 1.0A	1.3V @ 1.0A	1.3V @ 1.0A	1.3V @ 1.0A	1.3V @ 1.5A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA	10μA
t_{rr}(100V thru 400V)	200ns	200ns	200ns	200ns	200ns
t_{rr}(600V thru 800V)	300ns	300ns	300ns	300ns	300ns
t_{rr}(1000V)	500ns	500ns	500ns	500ns	500ns

Bridge Rectifiers, Fast Recovery
(Continued)

I_O (AMPS)	4.0		6.0		8.0
@ T_A (°C)	50	4.0 @ 25	50	50	50
@ T_C (°C)		8.0 @ 100	100	50	100
I_{FSM} (AMPS)	200	300	150	250	300
CASE	CASE D	CASE DM	CASE CM	CASE DM	
V_{RRM} (VOLTS)					
100	CBR 4F-L010	CBR 4MF-L010	CBR 6F-010	CBR 6MF-L010	CBR 8MF-L010
200	CBR 4F-L020	CBR 4MF-L020	CBR 6F-020	CBR 6MF-L020	CBR 8MF-L020
400	CBR 4F-L040	CBR 4MF-L040	CBR 6F-040	CBR 6MF-L040	CBR 8MF-L040
600	CBR 4F-L060	CBR 4MF-L060	CBR 6F-060	CBR 6MF-L060	CBR 8MF-L060
800	CBR 4F-L080	CBR 4MF-L080	CBR 6F-080	CBR 6MF-L080	CBR 8MF-L080
1000	CBR 4F-L100	CBR 4MF-L100	CBR 6F-100	CBR 6MF-L100	CBR 8MF-L100

V_F MAX @ I_F	1.3V @ 3.0A	1.3V @ 2.0A	1.3V @ 3.0A	1.3V @ 3.0A	1.3V @ 4.0A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA	10μA
t_{rr}(100V thru 400V)	200ns	200ns	200ns	200ns	200ns
t_{rr}(600V thru 800V)	300ns	300ns	300ns	300ns	300ns
t_{rr}(1000V)	500ns	500ns	500ns	500ns	500ns

Bridge Rectifiers, Fast Recovery
(Continued)

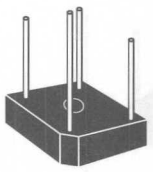
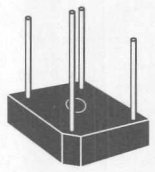
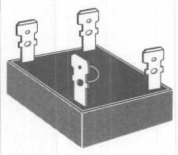
I_O (AMPS)	10		25	35
@ T_A (°C)				
@ T_C (°C)	100	60	60	60
I_{FSM} (AMPS)	150	300	350	400
CASE	 CASE CM	 CASE FP		
V_{RRM} (VOLTS)				
100	CBR10F-J010	CBR10F-010P	CBR25F-010P	CBR35F-010P
200	CBR10F-J020	CBR10F-020P	CBR25F-020P	CBR35F-020P
400	CBR10F-J040	CBR10F-040P	CBR25F-040P	CBR35F-040P
600	CBR10F-J060	CBR10F-060P	CBR25F-060P	CBR35F-060P
800	CBR10F-J080			
1000	CBR10F-J100			

V_F MAX @ I_F	1.3V @ 5.0A	1.3V @ 5.0A	1.3V @12.5A	1.3V @ 17.5A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA
t_{rr}(100V thru 400V)	200ns	200ns	200ns	200ns
t_{rr}(600V thru 800V)	300ns	300ns	300ns	300ns
t_{rr}(1000v)	500ns			

Bridge Rectifiers, Controlled Avalanche*

Single Phase, Full Wave

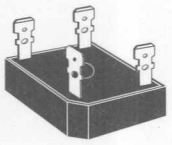
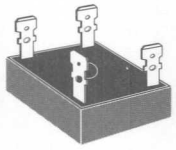
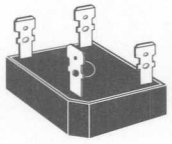
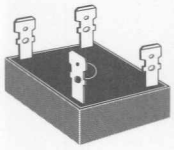
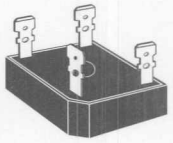
1.5 to 35 Amperes
200 to 800 Volts

I_O (AMPS)	1.5	2.0	3.0	6.0	10	
@ T_A (°C)	50	55	2.0 @ 25	50		
@ T_C (°C)			3.0 @ 50	100	100	60
I_{FSM} (AMPS)	50	60	50	150	150	300
CASE	 CASE A		 CASE C	 CASE CM		 CASE F
V_{RRM} (VOLTS)						
200	CBR1A-020	CBR2A-020	CBR3A-P020	CBR6A-020	CBR10A-J020	CBR10A-020
400	CBR1A-040	CBR2A-040	CBR3A-P040	CBR6A-040	CBR10A-J040	CBR10A-040
600	CBR1A-060	CBR2A-060	CBR3A-P060	CBR6A-060	CBR10A-J060	CBR10A-060
800	CBR1A-080	CBR2A-080	CBR3A-P080	CBR6A-080	CBR10A-J080	CBR10A-080

V_F MAX @ I_F	1.0V @ 1.0A	1.1V @ 2.0A	1.1V @ 1.5A	1.1V @ 3.0A	1.2V @ 5.0A	1.2V @ 5.0A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA	10μA	10μA

V_{RRM}	* AVALANCHE BREAKDOWN VOLTAGE	
	MIN	MAX
200V	250	700
400V	450	900
600V	650	1100
800V	850	1300

Bridge Rectifiers, Controlled Avalanche*
(Continued)

I_O (AMPS)	10	25		35	
@ T_A (°C)					
@ T_C (°C)	60	60	60	60	60
I_{FSM} (AMPS)	300	350	350	400	400
CASE	 CASE FP	 CASE F	 CASE FP	 CASE F	 CASE FP
V_{RRM} (VOLTS)					
200	CBR10A-020P	CBR25A-020	CBR25A-020P	CBR35A-020	CBR35A-020P
400	CBR10A-040P	CBR25A-040	CBR25A-040P	CBR35A-040	CBR35A-040P
600	CBR10A-060P	CBR25A-060	CBR25A-060P	CBR35A-060	CBR35A-060P
800	CBR10A-080P	CBR25A-080	CBR25A-080P	CBR35A-080	CBR35A-080P

V_F MAX @ I_F	1.2V @ 5.0A	1.2V @ 12.5A	1.2V @ 12.5A	1.2V @ 17.5A	1.2V @ 17.5A
I_R MAX @ V_{RRM}	10μA	10μA	10μA	10μA	10μA

V_{RRM}	* AVALANCHE BREAKDOWN VOLTAGE	
	MIN	MAX
200V	250	700
400V	450	900
600V	650	1100
800V	850	1300

Thyristors

SCRs (Silicon Controlled Rectifiers)

Metal/Plastic Packages

0.8 to 110 Amperes RMS
15 to 1200 Volts

I_T (AMPS)	0.8					
@ T_C (°C)	55	55	55	55	60	60
I_{TSM} (AMPS)	6.0	6.0	6.0	6.0	10	10
CASE	TO-18				TO-92	TO-92-18R
V_{RRM} (VOLTS)						
15	2N876	2N884				
30	2N877	2N885	2N3001	2N3005	2N5060	BRX44
60	2N878	2N886	2N3002	2N3006	2N5061	BRX45
100	2N879	2N887	2N3003	2N3007	2N5062	BRX46
150	2N880	2N888			2N5063	
200	2N881	2N889	2N3004	2N3008	2N5064	BRX47
300	2N882	2N890			2N6564	BRX48
400	2N883	2N891			2N6565	BRX49

I_{GT}	200µA	20µA	20µA	200µA	200µA	200µA
V_{GT}	0.8V	0.7V	0.7V	0.8V	0.8V	0.8V
I_H	5.0mA	5.0mA	3.0mA	5.0mA	5.0mA	5.0mA

SCRs
(Continued)

I_T (AMPS)	0.8				
@ T_C (°C)	60	60	60	60	60
I_{TSM} (AMPS)	10	10	10	10	10
CASE	 TO-92-18R			 TO-92	
V_{RRM} (VOLTS)					
30	C103Y				
60	C103YY				
100	C103A				
200	C103B	CS55B	CS55BZ	CS92B	CS92BZ
400		CS55D	CS55DZ	CS92D	CS92DZ
600				CS92M	CS92MZ
800				CS92N	CS92NZ

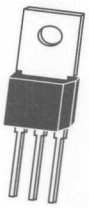
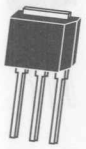
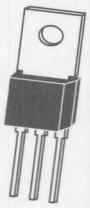
I_{GT}	200µA	200µA	20µA	200µA	20µA
V_{GT}	0.8V	0.8V	0.8V	0.8V	0.8V
I_H	5.0mA	5.0mA	5.0mA	5.0mA	5.0mA

SCRs
(Continued)

I_T (AMPS)	1.0		1.6		
@ T_C (°C)	90	90	70	70	70
I_{TSM} (AMPS)	10	10	15	15	15
CASE	 TO-18		 TO-39		
V_{RRM} (VOLTS)					
25					2N2322
50			2N1595	2N1595A	2N2323
100			2N1596	2N1596A	2N2324
150					2N2325
200	CS18B	CS18BZ	2N1597	2N1597A	2N2326
250					2N2327
300			2N1598	2N1598A	2N2328
400	CS18D	CS18DZ	2N1599	2N1599A	2N2329
600	CS18M	CS18MZ			
800	CS18N	CS18NZ			

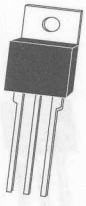
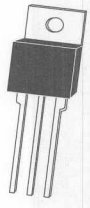
I_{GT}	200µA	20µA	10mA	2.0mA	200µA
V_{GT}	0.8V	0.8V	2.0V	2.0V	0.8V
I_H	5.0mA	5.0mA	20mA	5.0mA	2.0mA

SCRs
(Continued)

I_T (AMPS)	1.6	4.0			
@ T_C (°C)	55	90	85	85	30
I_{TSM} (AMPS)	6.0	35	30	30	20
CASE	 TO-18	 TO-39	 TO-202	 TO-202-2	 TO-202
V_{RRM} (VOLTS)					
50	2N6605				
60	2N6606				
100	2N6607				C106A1
200	2N6608	CS39-4B	CS202-4B	CS202-4B-2	C106B1
300					C106C1
400		CS39-4D	CS202-4D	CS202-4D-2	C106D1
500					C106E1
600		CS39-4M	CS202-4M	CS202-4M-2	C106M1
800		CS39-4N			

I_{GT}	200µA	200µA	200µA	200µA	200µA
V_{GT}	0.8V	0.8V	0.8V	0.8V	0.8V
I_H	5.0mA	5.0mA	5.0mA	5.0mA	5.0mA

SCRs
(Continued)

I_T (AMPS)	8.0			10	12
@ T_C (°C)	90	100	100	90	90
I_{TSM} (AMPS)	90	100	100	100	120
CASE	 TO-220	 TO-64		 TO-220	
V_{RRM} (VOLTS)					
25		2N1770,A	2N4167		
50		2N1771,A	2N4168		
100		2N1772,A	2N4169		
150		2N1773,A			
200	CS220-8B	2N1774,A	2N4170	CS220-10B	CS220-12B
250		2N1775,A			
300		2N1776,A	2N4171		
400	CS220-8D	2N1777,A	2N4172	CS220-10D	CS220-12D
500		2N1778,A	2N4173		
600	CS220-8M	2N2619	2N4174	CS220-10M	CS220-12M
800	CS220-8N			CS220-10N	CS220-12N
1000					CS220-12P

I_{GT}	15mA	15mA	30mA	15mA	15mA
V_{GT}	1.5V	1.5V	1.5V	1.5V	1.5V
I_H	30mA	25mA	30mA	30mA	30mA

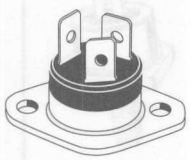
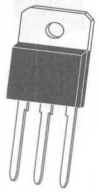
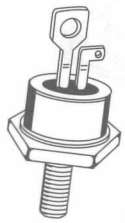
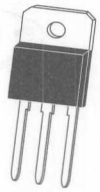
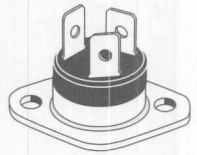
SCRs
(Continued)

I_T (AMPS)	16			25	
@ T_C (°C)	90	90	90	70	90
I_{TSM} (AMPS)	200	200	160	200	250
CASE	TO-3		TO-220	TO-48	TO-220
V_{RRM} (VOLTS)					
25				2N681,A	
50				2N682,A	
100	2N3668			2N683,A	
150				2N684,A	
200	2N3669	CS3-16B	CS220-16B*	2N685,A	CS220-25B
250				2N686,A	
300				2N687,A	
400	2N3670	CS3-16D	CS220-16D*	2N688,A	CS220-25D
500				2N689,A	
600	2N4103	CS3-16M	CS220-16M*	2N690,A	CS220-25M
700				2N691,A	
800		CS3-16N	CS220-16N*	2N692,A	CS220-25N
1000			CS220-16P*		CS220-25P
1200					CS220-25PB

I_{GT}	40mA	25mA	25mA	40mA	40mA
V_{GT}	2.0V	2.0V	1.5V	2.0V	1.5V
I_H	50mA	40mA	40mA	50mA	50mA

* Not recommended for new designs.

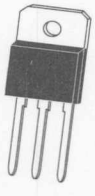
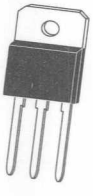
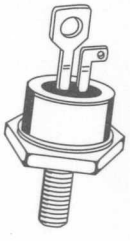
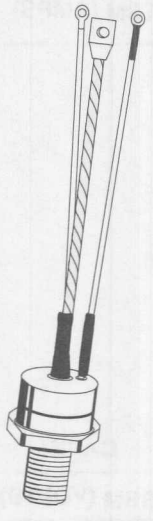
SCRs
(Continued)

I_T (AMPS)	30		35		40
@ T_C (°C)	75	85	75	85	75
I_{TSM} (AMPS)	400	400	330	400	500
CASE	TO-3P 	TO-218 ISOL 	TO-48 	TO-218 	TO-3P 
V_{RRM} (VOLTS)	ISOLATED	ISOLATED			ISOLATED
200	CS3P-30B*	CS218I-30B	CS48-35B	CS218-35B*	CS3P-40B
400	CS3P-30D*	CS218I-30D	CS48-35D	CS218-35D*	CS3P-40D
600	CS3P-30M*	CS218I-30M	CS48-35M	CS218-35M*	CS3P-40M
800	CS3P-30N*	CS218I-30N	CS48-35N	CS218-35N*	CS3P-40N
1000	CS3P-30P*	CS218I-30P	CS48-35P	CS218-35P*	CS3P-40P
1200	CS3P-30PB*	CS218I-30PB	CS48-35PB	CS218-35PB*	CS3P-40PB

I_{GT}	50mA	50mA	40mA	50mA	80mA
V_{GT}	1.5V	1.5V	1.5V	1.5V	1.5V
I_H	75mA	75mA	100mA	75mA	150mA

* Not recommended for new designs.

SCRs
(Continued)

I_T (AMPS)	50	55	70	110	
@ T_C (°C)	75	75	110	80	80
I_{TSM} (AMPS)	500	500	1000	1600	1600
					
CASE	TO-218 ISOL	TO-218	TO-65	TO-83	TO-94
V_{RRM} (VOLTS)	ISOLATED				
200	CS218I-50B	CS218-55B*	CS65-70B	CS83-110B	CS94-110B
400	CS218I-50D	CS218-55D*	CS65-70D	CS83-110D	CS94-110D
600	CS218I-50M	CS218-55M*	CS65-70M	CS83-110M	CS94-110M
800	CS218I-50N	CS218-55N*	CS65-70N	CS83-110N	CS94-110N
1000	CS218I-50P	CS218-55P*	CS65-70P	CS83-110P	CS94-110P
1200	CS218I-50PB	CS218-55PB*	CS65-70PB	CS83-110PB	CS94-110PB

I_{GT}	80mA	80mA	100mA	100mA	100mA
V_{GT}	1.5V	1.5V	3.0V	3.0V	3.0V
I_H	150mA	150mA	200mA	100mA	100mA

* Not recommended for new designs.

Triacs

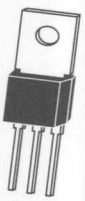
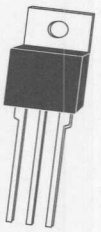
Metal/Plastic Packages

1.0 to 45 Amperes
200 to 800 Volts

I_T (AMPS)	1.0		2.0		4.0
@ T_C (°C)	50	50	80	80	80
I_{TSM} (AMPS)	20	20	10	10	35
CASE	 TO-92		 SOT-89		 TO-39
V_{RRM} (VOLTS)					
200	CQ92B	CQ92BT	CQ89B	CQ89BS	CQ39BT
400	CQ92D	CQ92DT	CQ89D	CQ89DS	CQ39DT
600	CQ92M	CQ92MT	CQ89M	CQ89MS	CQ39MT
800			CQ89N	CQ89NS	

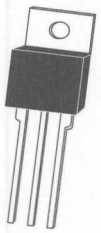
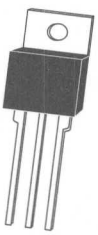
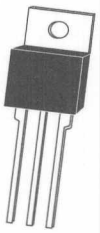
I_{GT} QI	5.0mA	3.0mA	25mA	5.0mA	3.0mA
I_{GT} QII	5.0mA	3.0mA	25mA	5.0mA	3.0mA
I_{GT} QIII	5.0mA	3.0mA	25mA	5.0mA	3.0mA
I_{GT} QIV	5.0mA	3.0mA	25mA	5.0mA	3.0mA
V_{GT} QI - QIV	2.0V	2.0V	2.0V	2.0V	2.0V
I_H	5.0mA	3.0mA	25mA	5.0mA	3.0mA

Triacs
(Continued)

I_T (AMPS)	4.0				6.0
@ T_C (°C)	80	80	80	80	90
I_{TSM} (AMPS)	40	40	40	40	60
CASE	 TO-202		 TO-202-2		 TO-220
V_{RRM} (VOLTS)					
200	CQ202-4B	CQ202-4BS	CQ202-4B-2	CQ202-4BS-2	CQ220-6BS
400	CQ202-4D	CQ202-4DS	CQ202-4D-2	CQ202-4DS-2	CQ220-6DS
600	CQ202-4M	CQ202-4MS	CQ202-4M-2	CQ202-4MS-2	CQ220-6MS
800	CQ202-4N	CQ202-4NS	CQ202-4N-2	CQ202-4NS-2	CQ220-6NS

I_{GT} QI	25mA	5.0mA	25mA	5.0mA	5.0mA
I_{GT} QII	25mA	5.0mA	25mA	5.0mA	5.0mA
I_{GT} QIII	25mA	5.0mA	25mA	5.0mA	5.0mA
I_{GT} QIV	25mA	5.0mA	25mA	5.0mA	10mA
V_{GT} QI - QIV	2.0V	2.0V	2.0V	2.0V	1.5V
I_H	25mA	5.0mA	25mA	5.0mA	15mA

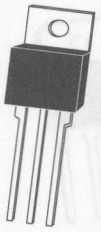
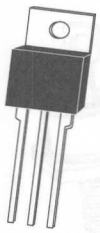
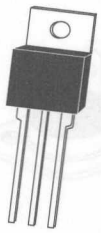
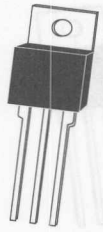
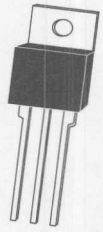
Triacs
(Continued)

I_T (AMPS)	6.0	8.0			
@ T_C (°C)	90	90	90	90	90
I_{TSM} (AMPS)	60	80	80	80	80
					
	TO-220 ISOL	TO-220		TO-220 ISOL	
CASE	ISOLATED			ISOLATED	
V_{RRM} (VOLTS)					
200	CQ220I-6BS*	CQ220-8B	CQ220-8BR*	CQ220I-8B	CQ220I-8BR*
400	CQ220I-6DS*	CQ220-8D	CQ220-8DR*	CQ220I-8D	CQ220I-8DR*
600	CQ220I-6MS*	CQ220-8M	CQ220-8MR*	CQ220I-8M	CQ220I-8MR*
800	CQ220I-6NS*	CQ220-8N	CQ220-8NR*	CQ220I-8N	CQ220I-8NR*

I_{GT} QI	5.0mA	25mA	10mA	25mA	10mA
I_{GT} QII	5.0mA	25mA	10mA	25mA	10mA
I_{GT} QIII	5.0mA	25mA	10mA	25mA	10mA
I_{GT} QIV	10mA	50mA	25mA	50mA	25mA
V_{GT} QI - QIV	1.5V	1.5V	1.5V	1.5V	1.5V
I_H	15mA	25mA	25mA	25mA	25mA

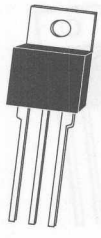
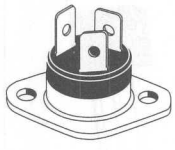
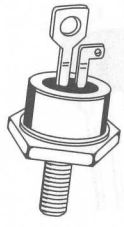
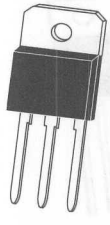
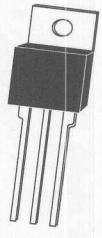
* Not recommended for new designs

Triacs
(Continued)

I_T (AMPS)	10		12		16
@ T_C (°C)	90	90	90	90	90
I_{TSM} (AMPS)	100	100	125	125	170
					
	TO-220	TO-220 ISOL	TO-220	TO-220 ISOL	TO-220
CASE		ISOLATED		ISOLATED	
V_{RRM} (VOLTS)					
200	CQ220-10B	CQ220I-10B	CQ220-12B	CQ220I-12B	CQ220-16B
400	CQ220-10D	CQ220I-10D	CQ220-12D	CQ220I-12D	CQ220-16D
600	CQ220-10M	CQ220I-10M	CQ220-12M	CQ220I-12M	CQ220-16M
800	CQ220-10N	CQ220I-10N	CQ220-12N	CQ220I-12N	CQ220-16N

I_{GT} QI	25mA	25mA	25mA	25mA	50mA
I_{GT} QII	25mA	25mA	25mA	25mA	50mA
I_{GT} QIII	25mA	25mA	25mA	25mA	50mA
I_{GT} QIV	50mA	50mA	50mA	50mA	100mA
V_{GT} QI - QIV	1.5V	1.5V	1.5V	1.5V	1.5V
I_H	25mA	25mA	25mA	25mA	50mA

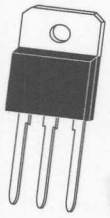
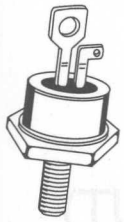
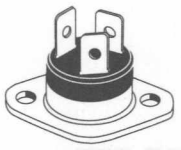
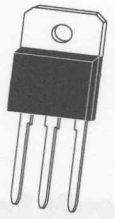
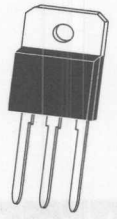
Triacs
(Continued)

I_T (AMPS)	16	25			
@ T_C (°C)	90	90	90	90	90
I_{TSM} (AMPS)	170	250	250	250	210
					
	TO-220 ISOL	TO-3P	TO-48	TO-218 ISOL	TO-220
CASE	ISOLATED	ISOLATED		ISOLATED	
V_{RRM} (VOLTS)					
200	CQ220I-16B	CQ3P-25B	CQ48-25B*	CQ218I-25B	CQ220-25B
400	CQ220I-16D	CQ3P-25D	CQ48-25D*	CQ218I-25D	CQ220-25D
600	CQ220I-16M	CQ3P-25M	CQ48-25M*	CQ218I-25M	CQ220-25M
800	CQ220I-16N	CQ3P-25N	CQ48-25N*	CQ218I-25N	CQ220-25N

I_{GT} QI	50mA	50mA	100mA	50mA	50mA
I_{GT} QII	50mA	50mA	100mA	50mA	50mA
I_{GT} QIII	50mA	50mA	100mA	50mA	50mA
I_{GT} QIV	100mA	100mA	150mA	100mA	100mA
V_{GT} QI - QIV	1.5V	1.5V	1.5V	1.5V	1.5V
I_H	50mA	80mA	100mA	80mA	50mA

* Not recommended for new designs.

Triacs
(Continued)

I_T (AMPS)	30	35	40		45
@ T_C (°C)	90	90	90	90	90
I_{TSM} (AMPS)	250	300	300	300	300
					
	TO-218	TO-48	TO-3P	TO-218 ISOL	TO-218
CASE			ISOLATED	ISOLATED	
V_{RRM} (VOLTS)					
200	CQ218-30B*	CQ48-35B*	CQ3P-40B	CQ218I-40B	CQ218-45B
400	CQ218-30D*	CQ48-35D*	CQ3P-40D	CQ218I-40D	CQ218-45D
600	CQ218-30M*	CQ48-35M*	CQ3P-40M	CQ218I-40M	CQ218-45M
800	CQ218-30N*	CQ48-35N*	CQ3P-40N	CQ218I-40N	CQ218-45N

I_{GT} QI	50mA	100mA	50mA	50mA	50mA
I_{GT} QII	50mA	100mA	50mA	50mA	50mA
I_{GT} QIII	50mA	100mA	50mA	50mA	50mA
I_{GT} QIV	100mA	150mA	100mA	100mA	100mA
V_{GT} QI - QIV	1.5V	1.5V	1.5V	1.5V	1.5V
I_H	80mA	100mA	80mA	80mA	80mA

* Not recommended for new designs.

Diac

DO-35 Case

TYPE NO.	V_{BO} (V)		ΔV_{BO} (V)	I_{BO} (μA)	$\lvert \Delta V \pm \rvert$ (V)	I_P (A)
	MIN	MAX	MAX	MAX	MIN	MAX
CT-32	28	36	3.0	50	5.0	2.0

Programmable UJTs (PUT)

TO-92

TO-92-18R

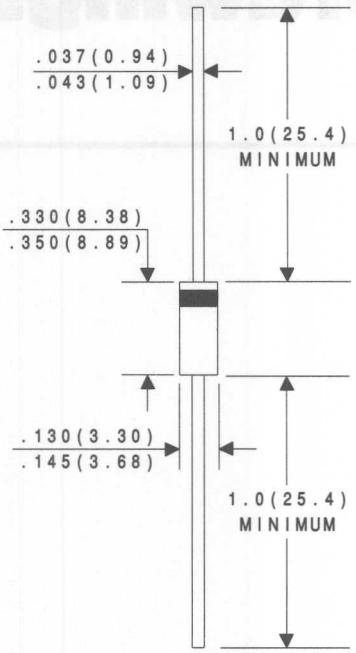
TYPE NO.	GATE TO ANODE REVERSE VOLTAGE	DC ANODE CURRENT	GATE TO ANODE LEAKAGE CURRENT	PEAK CURRENT		VALLEY CURRENT		CASE
	V_{GAR}	I_T	I_{GAO}	I_P		I_V		
			V_S=40Vdc	R_G=10KΩ	R_G=1.0MΩ	R_G=10KΩ	R_G=1.0MΩ	
	(V)	(mA)	(nA)	(μA)	(μA)	(μA)	(μA)	
	MIN	MIN	MAX	MAX	MAX	MIN	MAX	
2N6027	40	150	10	5.0	2.0	70	50	TO-92
2N6028	40	150	10	1.0	0.15	25	25	TO-92
PN6119-18R	40	300	10	5.0	2.0	70	50	TO-92-18R
PN6120-18R	40	300	10	1.0	0.15	25	25	TO-92-18R

Mechanical Drawings

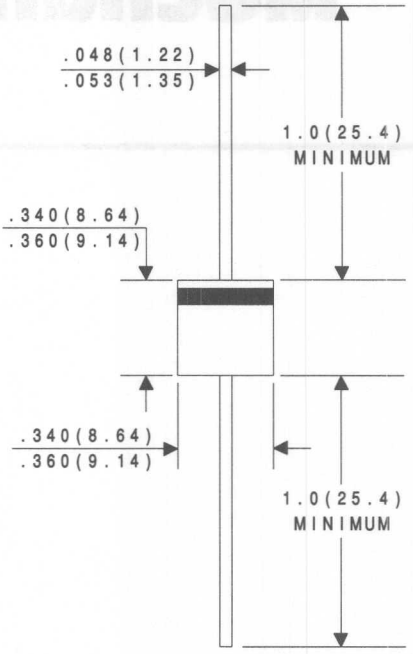
Mechanical Drawings

All Dimensions in inches (mm).

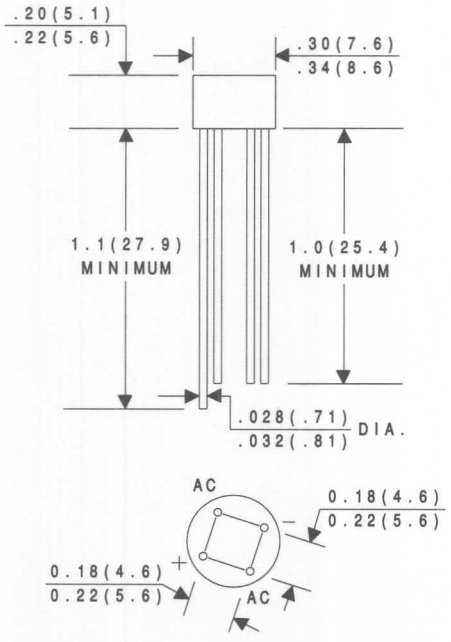
AX-5W



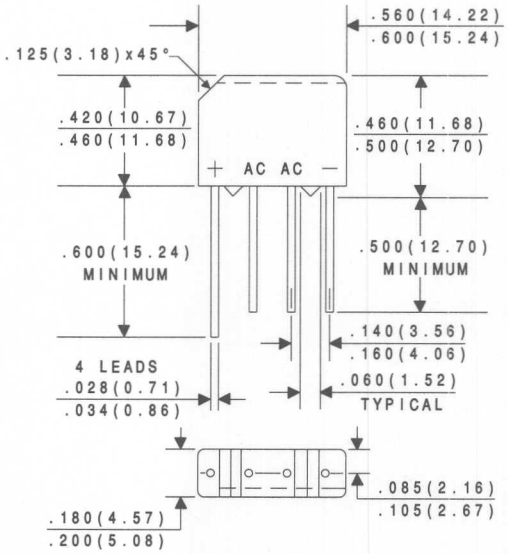
Case 106



Case A



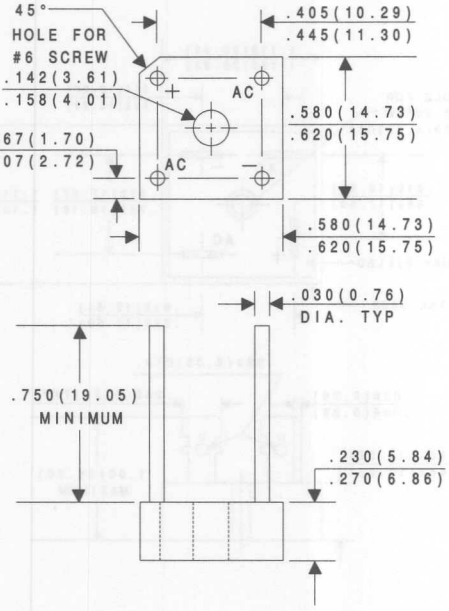
Case B-M



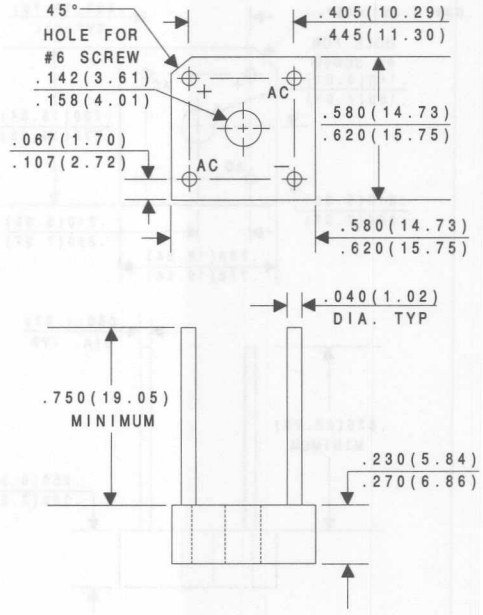
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

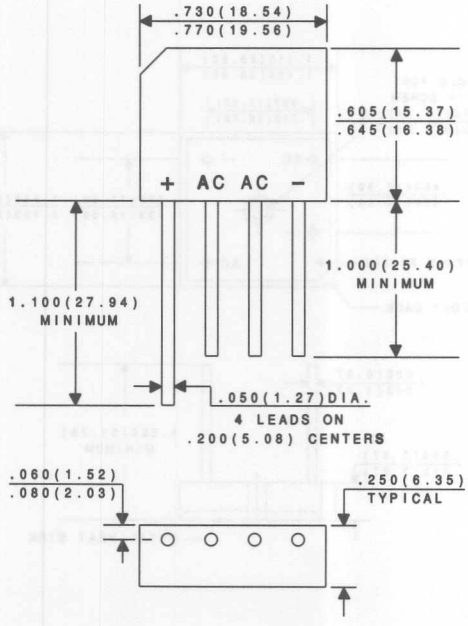
Case C



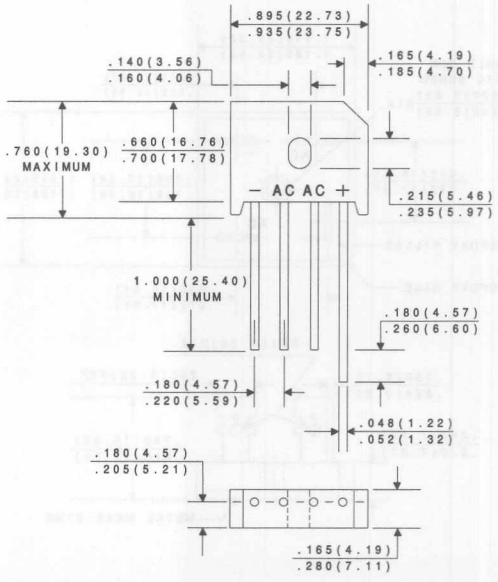
Case CM



Case D



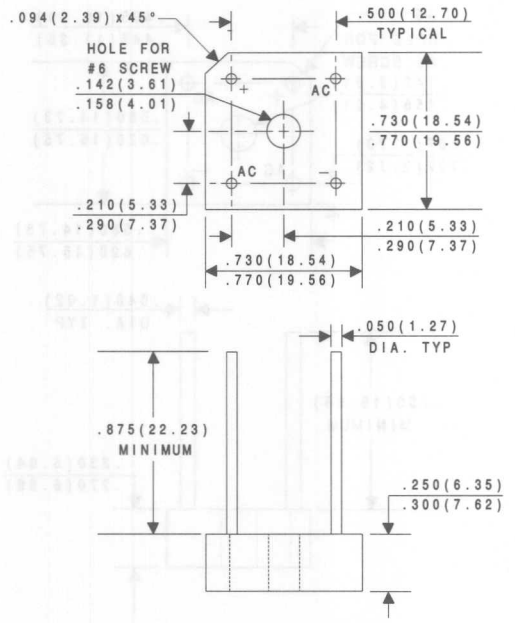
Case DM



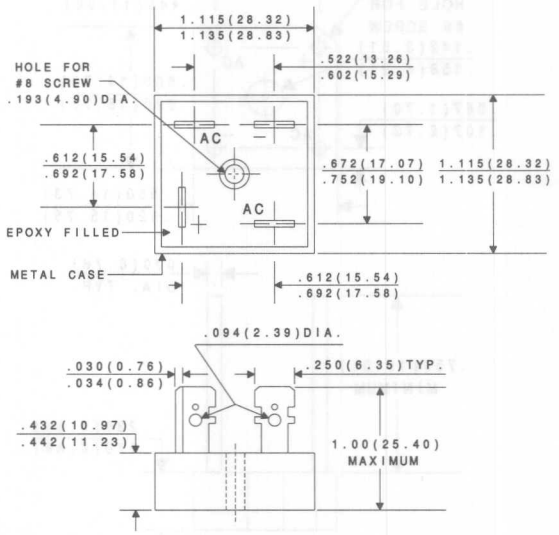
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

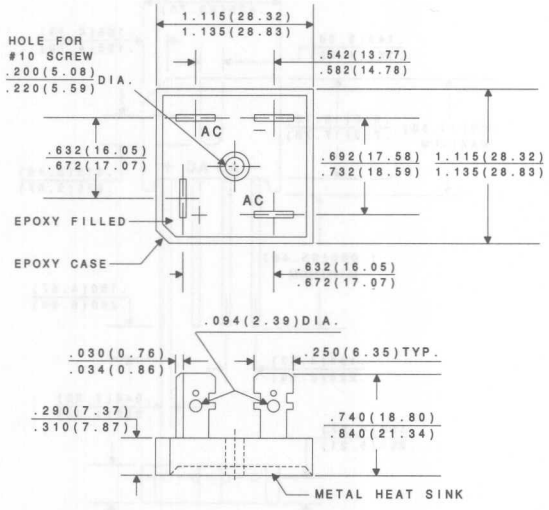
Case E



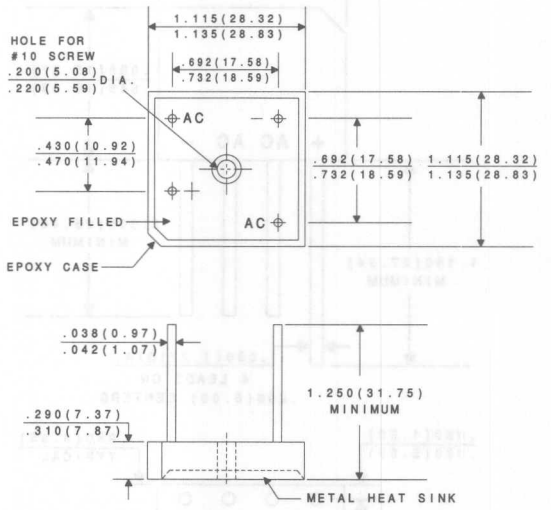
Case F



Case FP



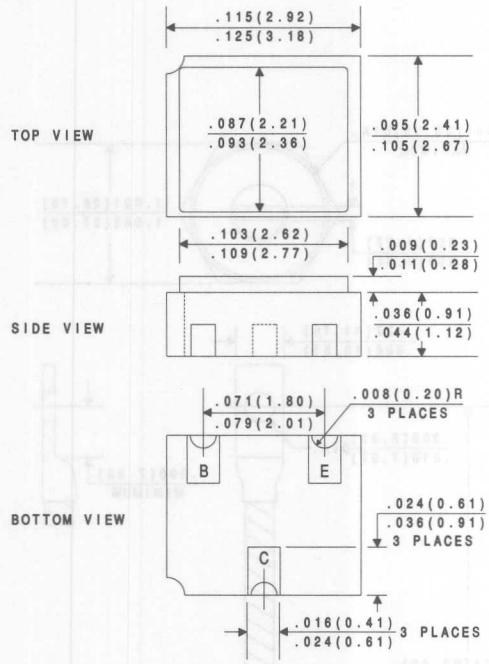
Case FPW



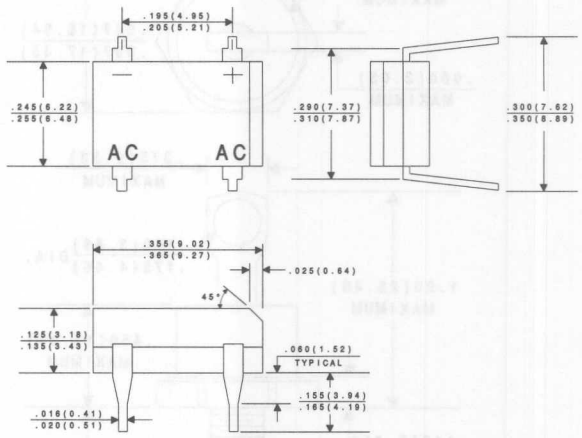
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

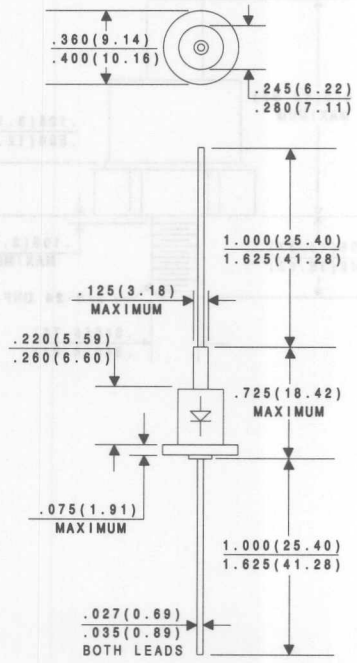
CERSOT-23



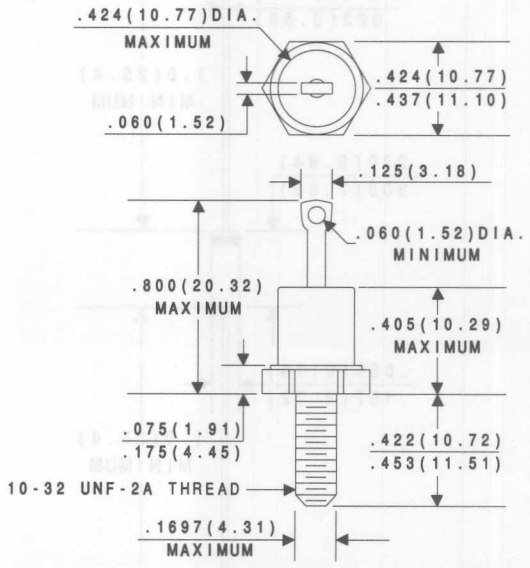
DIP



DO-1



DO-4

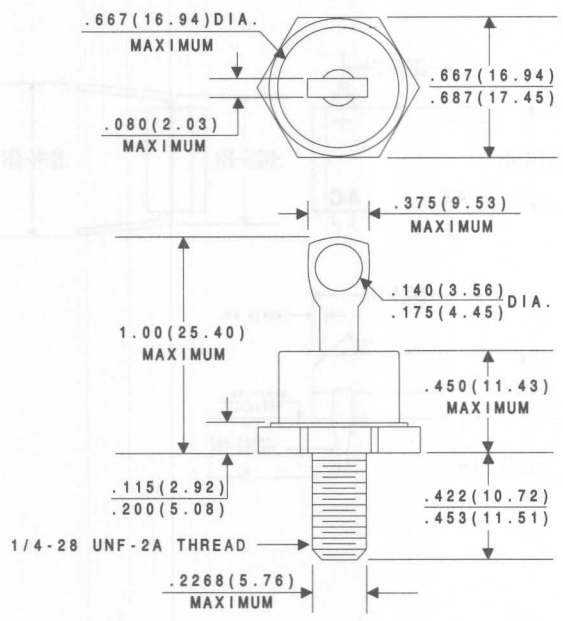


Central™ Semiconductor Corp.

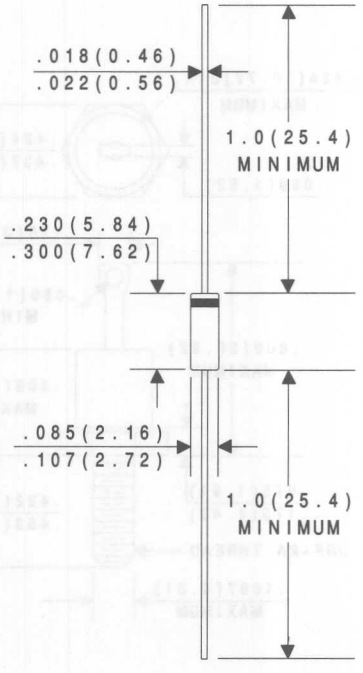
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

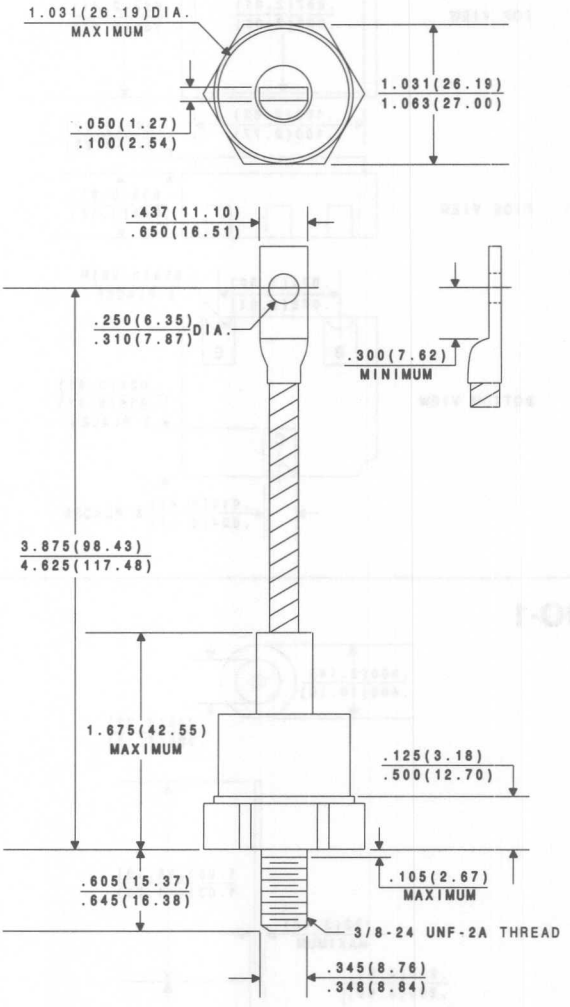
DO-5



DO-7



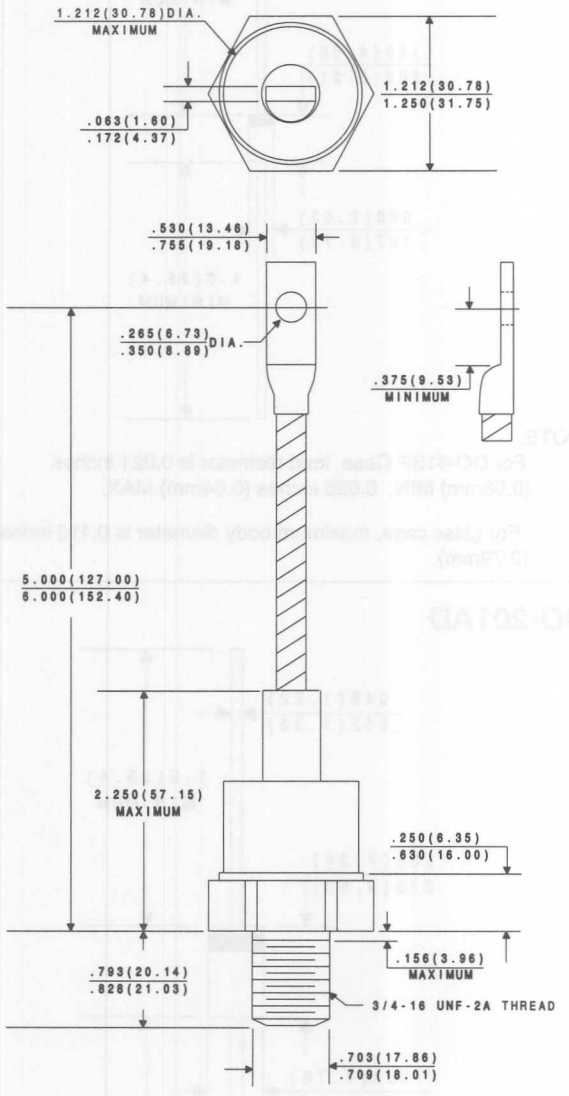
DO-8



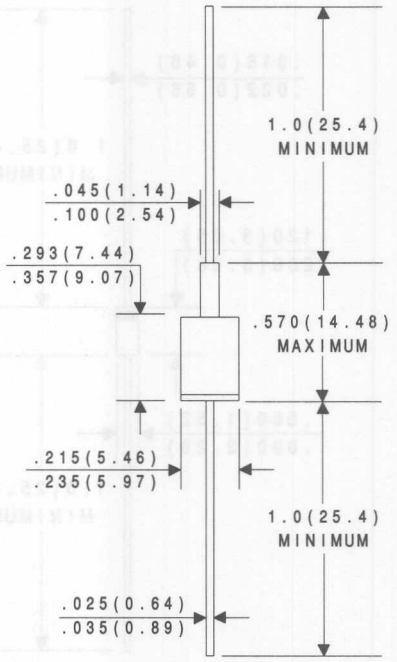
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

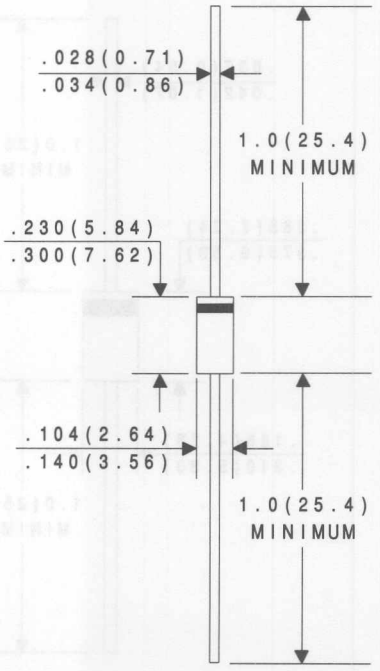
DO-9



DO-13



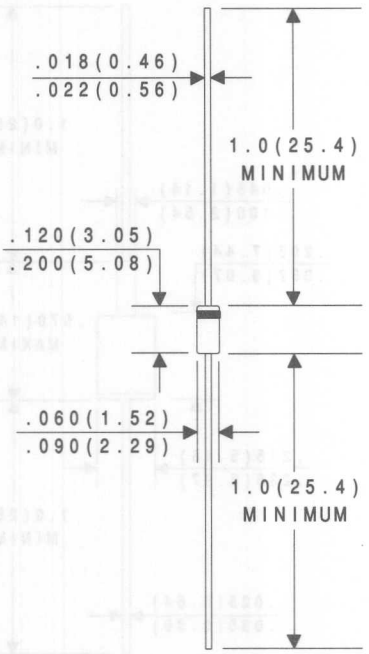
DO-15



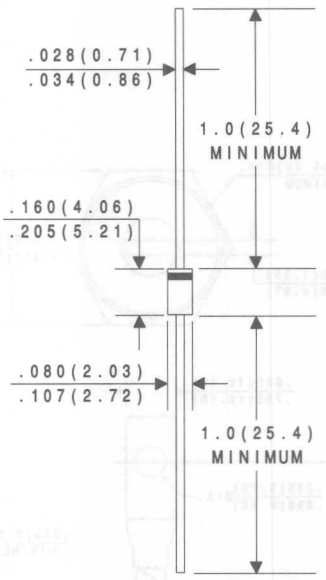
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

DO-35



DO-41

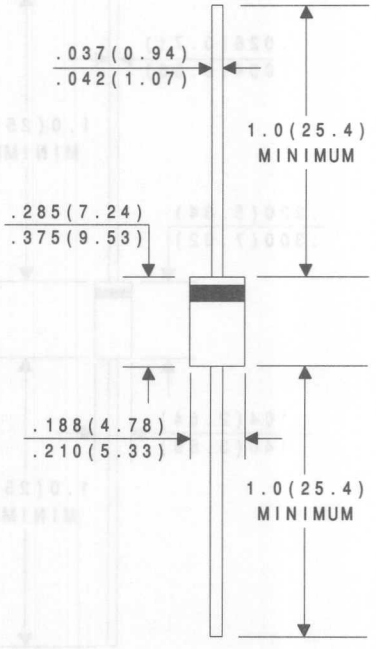


NOTE:

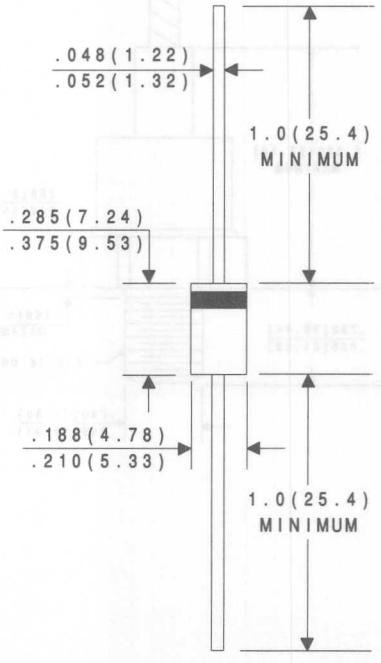
For DO-41SP Case, lead diameter is 0.021 inches (0.53mm) MIN, 0.025 inches (0.64mm) MAX.

For glass case, maximum body diameter is 0.110 inches (2.79mm).

DO-201



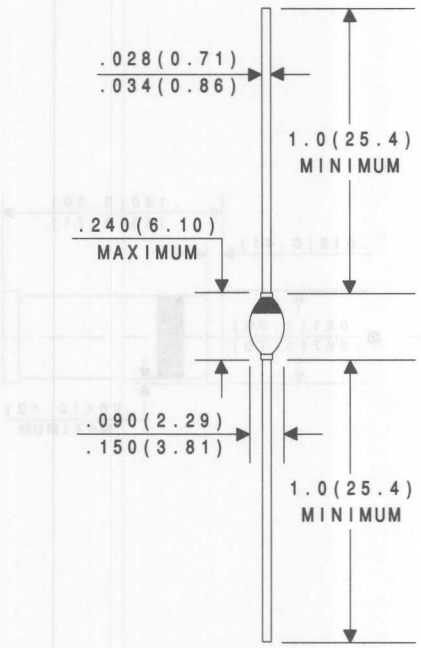
DO-201AD



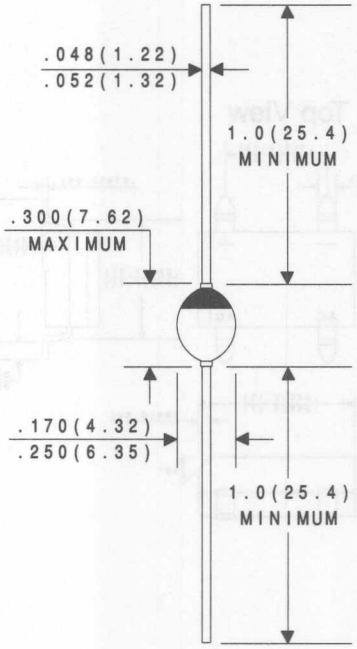
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

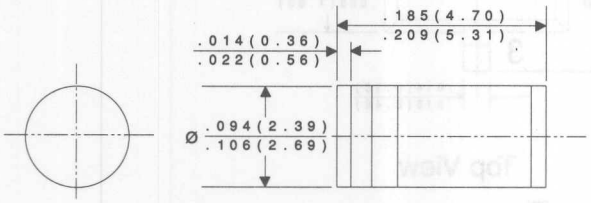
GPR-1A



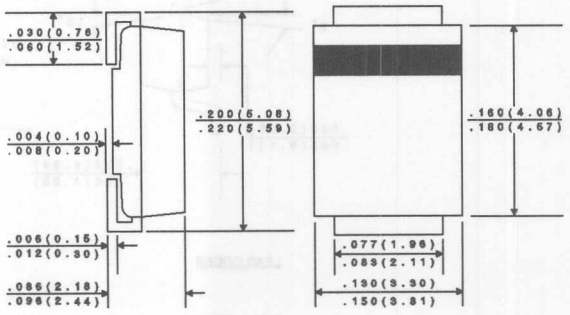
GPR-3A



MELF



SMB

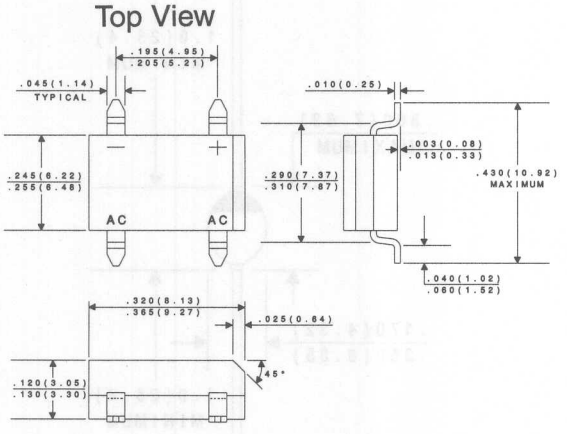


Top View

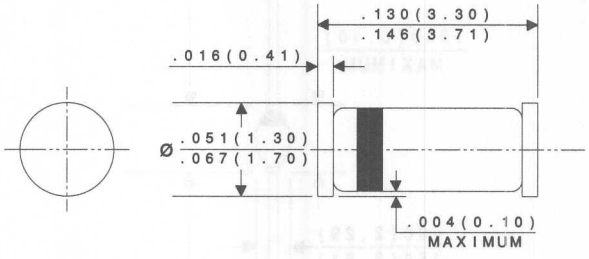
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

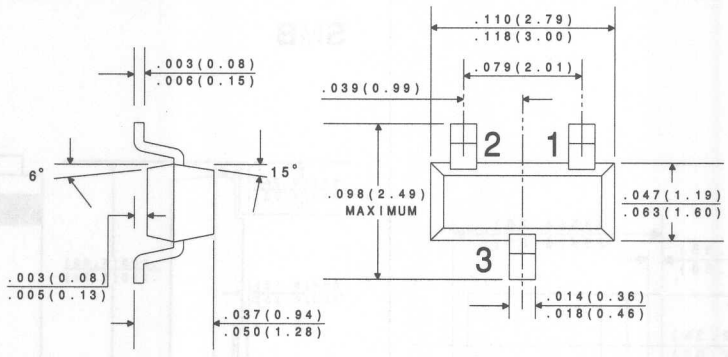
SMDIP



SOD-80



SOT-23



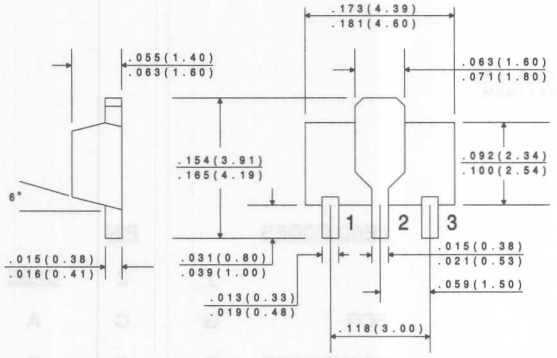
Top View

LEAD CODES	PIN 1	2	3
DIODE, SINGLE	ANODE	NO CONNECTION	CATHODE
DIODE, DUAL, COMM. CATHODE	ANODE	ANODE	CATHODE
DIODE, DUAL, COMM. ANODE	CATHODE	CATHODE	ANODE
DIODE, DUAL IN SERIES	ANODE	CATHODE	CATHODE, ANODE
JFET	DRAIN	SOURCE	GATE
STABISTOR	ANODE	NO CONNECTION	CATHODE
SCR	CATHODE	GATE	ANODE
TRANSISTOR	BASE	EMITTER	COLLECTOR
ZENER, SINGLE	ANODE	NO CONNECTION	CATHODE
ZENER, DUAL COMM. ANODE	CATHODE	CATHODE	ANODE

Mechanical Drawings (Continued)

All Dimensions in inches (mm).

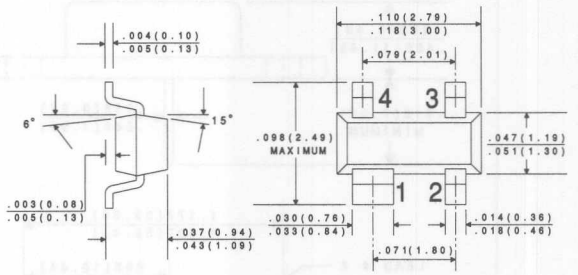
SOT-89



Bottom View

LEAD CODES	PIN 1	2	3
SCHOTTKY RECTIFIER	ANODE	CATHODE	ANODE
TRANSISTOR	EMITTER	COLLECTOR	BASE
TRIAC	GATE	MT2	MT1
ZENER DIODE	ANODE	CATHODE	ANODE

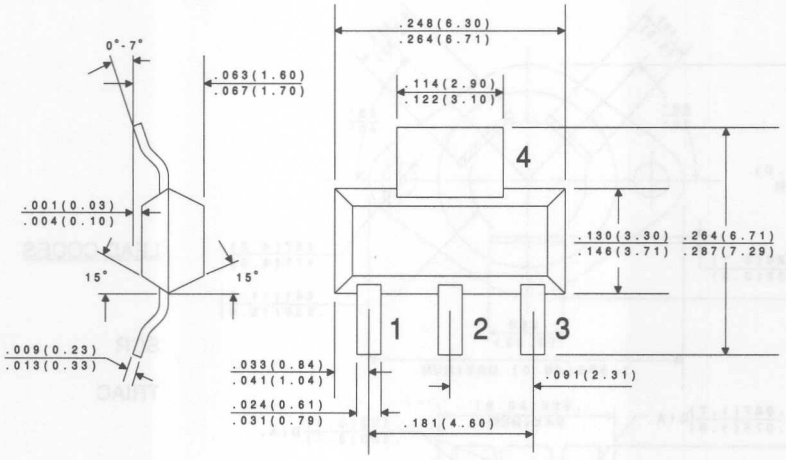
SOT-143



Top View

LEAD CODES	PIN 1	2	3	4
DIODE (DUAL, ISOLATED)	CATHODE #1	CATHODE #2	ANODE #2	ANODE #1

SOT-223



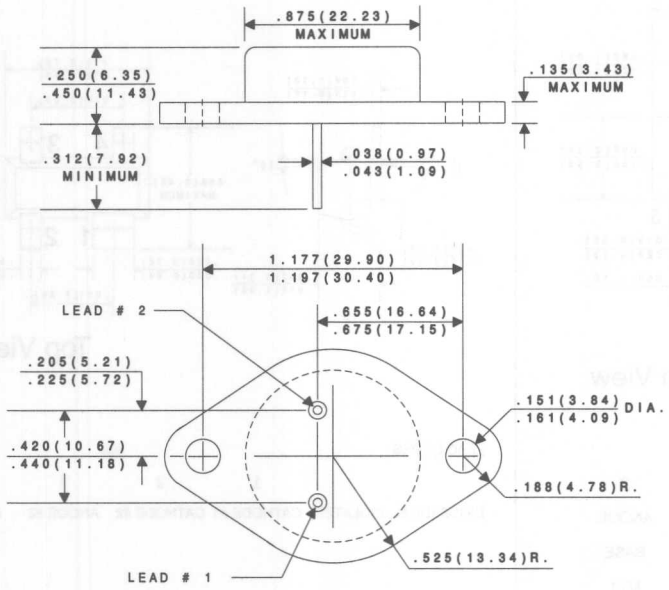
Top View

LEAD CODES	PIN 1	2	3	4
TRANSISTOR	BASE	COLLECTOR	EMITTER	COLLECTOR

Mechanical Drawings (Continued)

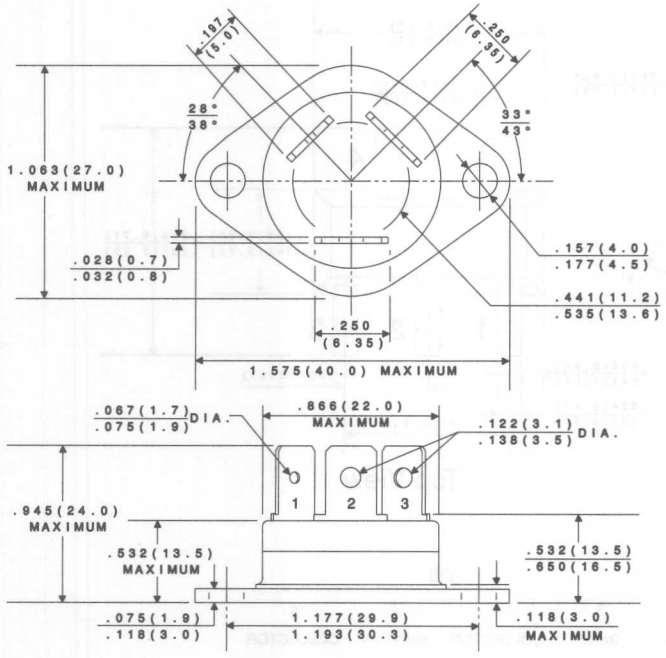
All Dimensions in inches (mm).

TO-3



LEAD CODES	PIN		
	1	2	CASE
SCR	G	C	A
TRANSISTOR	B	E	C

TO-3P



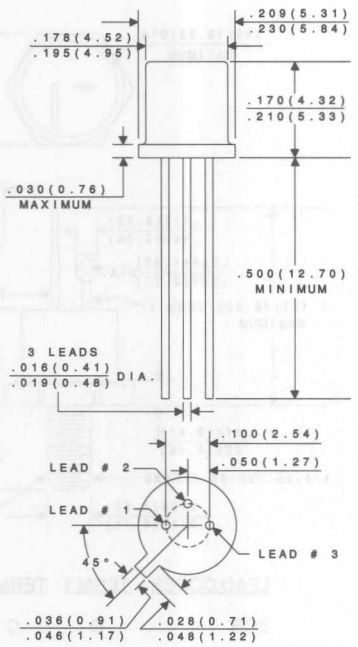
LEAD CODES	PIN		
	1	2	3
SCR	G	A	C
TRIAC	G	MT2	MT1

Mounting Base Isolated

Mechanical Drawings (Continued)

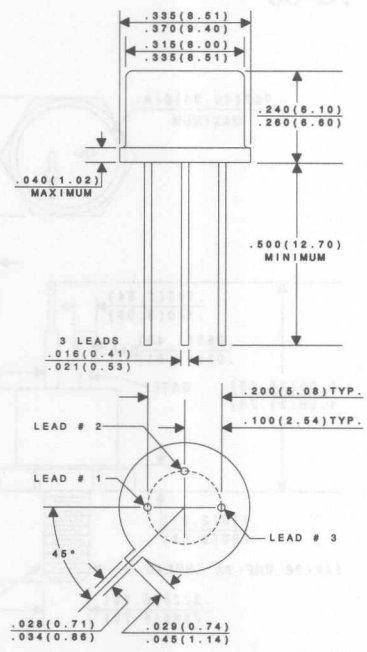
All Dimensions in inches (mm).

TO-18



LEAD CODES	PIN		
	1	2	3
FET	S	G	D
	S	D	G
SCR	C	G	A
TRANSISTOR	E	B	C

TO-39

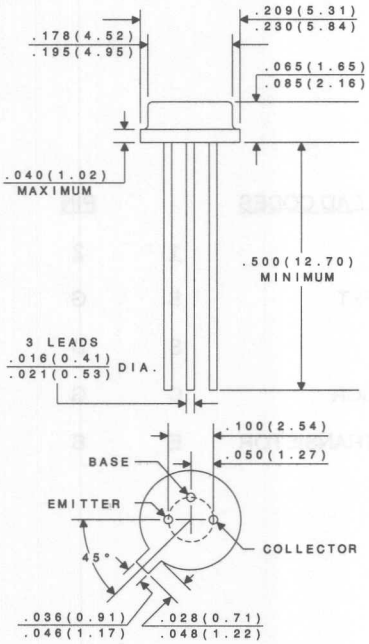


LEAD CODES	PIN		
	1	2	3
SCR	C	G	A
TRANSISTOR	E	B	C
TRIAC	MT1	G	MT2

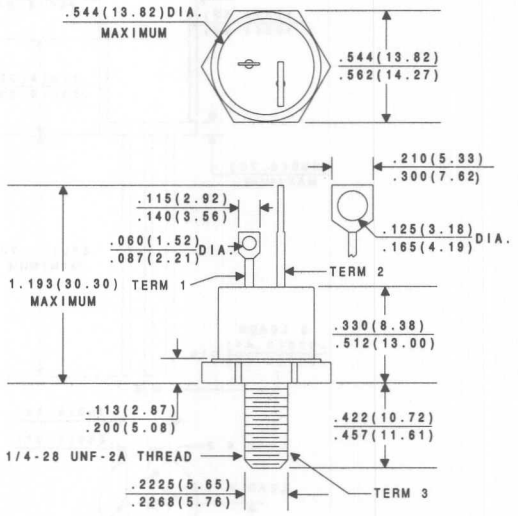
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

TO-46

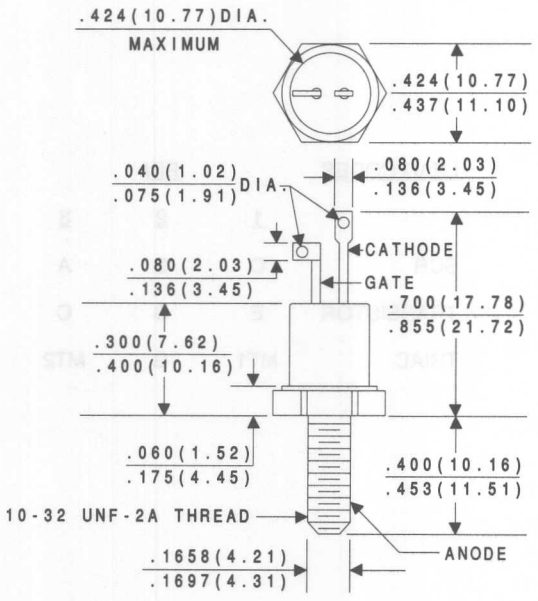


TO-48

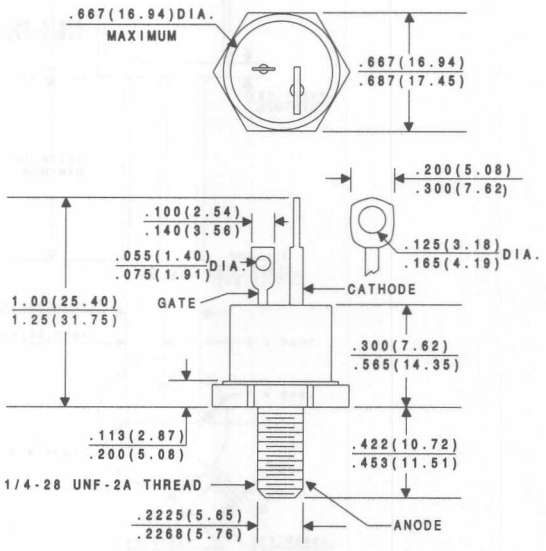


LEAD CODES	TERM 1	TERM 2	TERM 3
SCR	G	C	A
TRIAC	G	MT1	MT2

TO-64



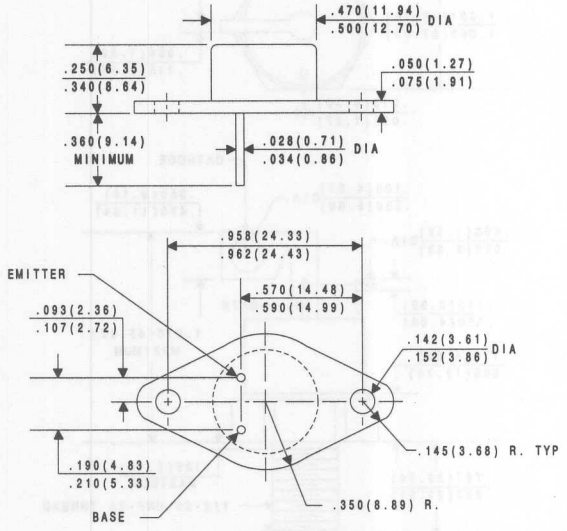
TO-65



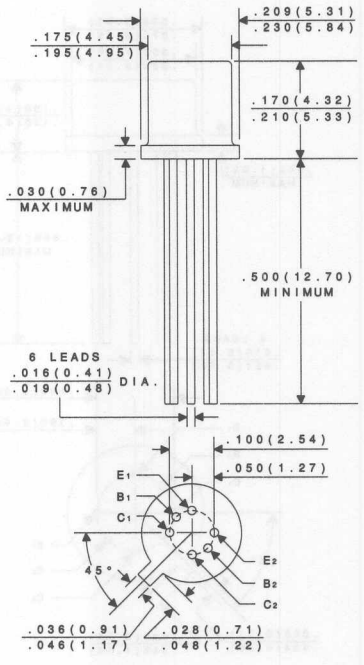
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

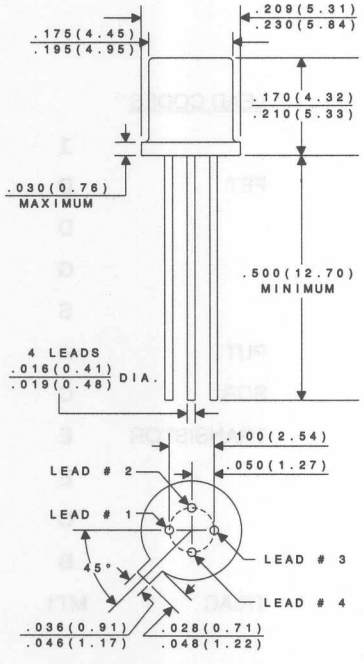
TO-66



TO-71



TO-72

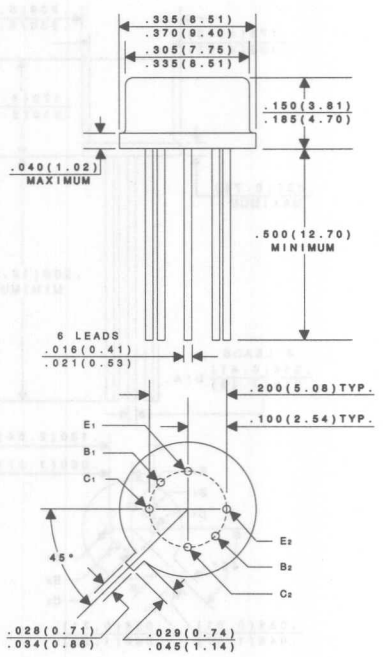


LEAD CODES	PIN			
	1	2	3	4
FET	S	G	D	CASE
	S	D	G	CASE
TRANSISTOR	E	B	C	GND

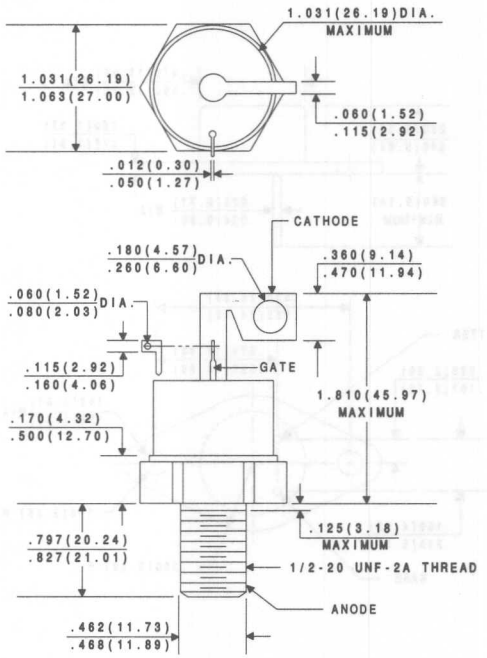
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

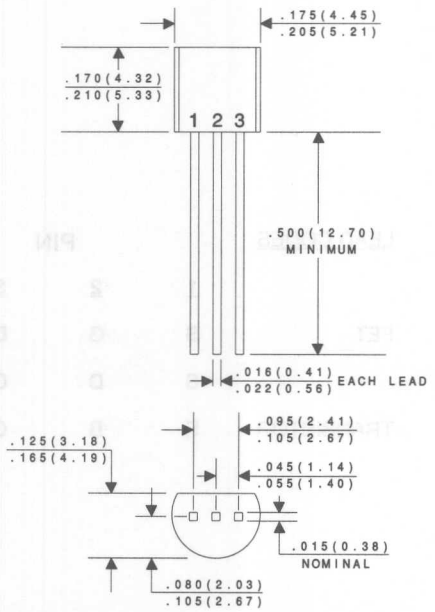
TO-78



TO-83



TO-92

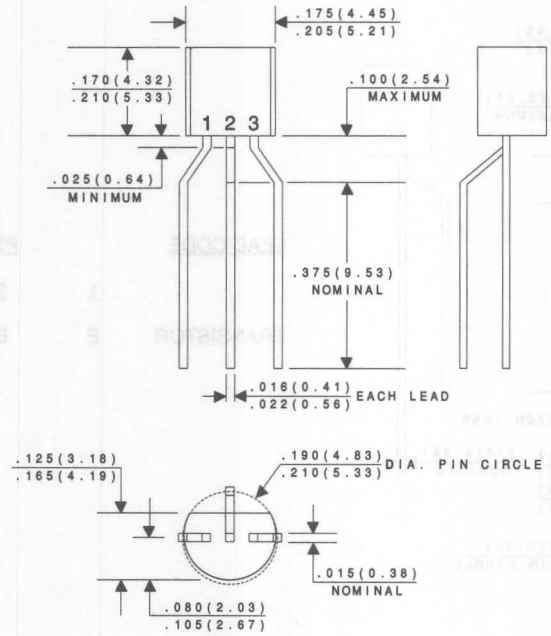


LEAD CODES	PIN		
	1	2	3
FET	D	S	G
	D	G	S
	G	S	D
	S	D	G
PUT	A	G	C
SCR	C	G	A
TRANSISTOR	E	B	C
	E	C	B
	C	B	E
	B	E	C
TRIAC	MT1	G	MT2

Mechanical Drawings (Continued)

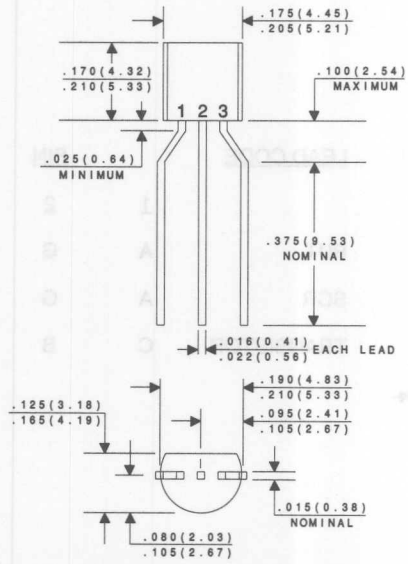
All Dimensions in inches (mm).

TO-92-5F

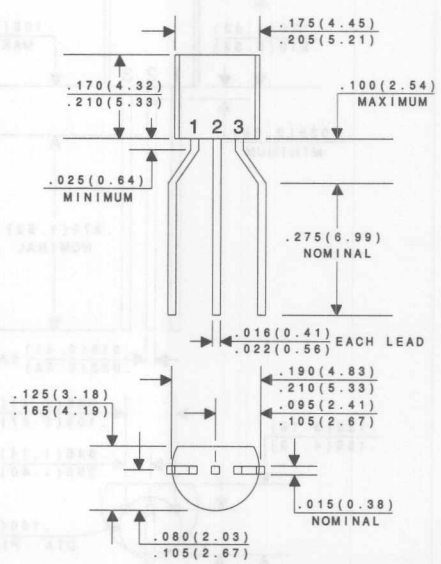


LEAD CODE	PIN		
	1	2	3
TRANSISTOR	E	B	C

TO-92-5T



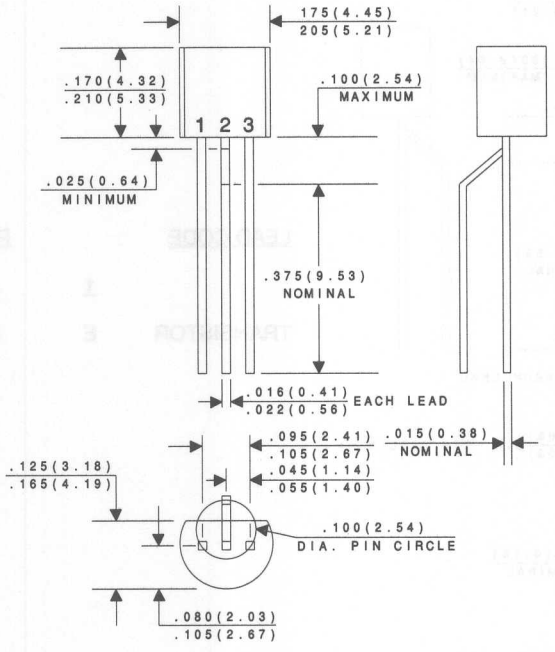
TO-92-5T1



Mechanical Drawings (Continued)

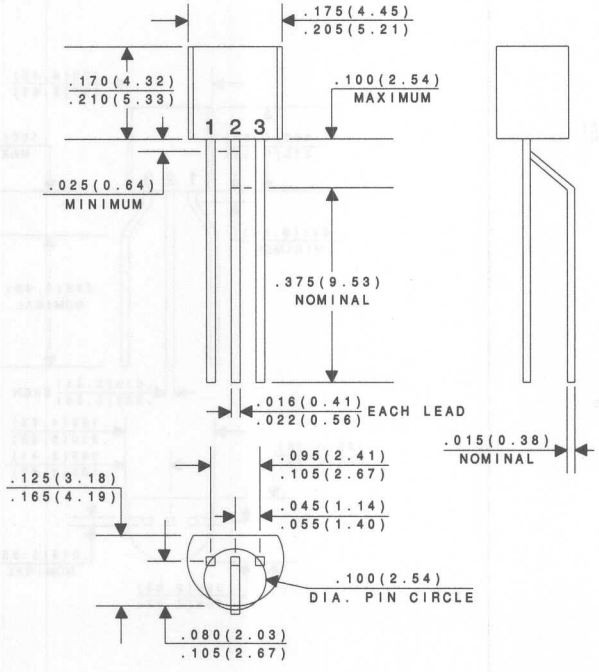
All Dimensions in inches (mm).

TO-92-18F



LEAD CODE	PIN 1	2	3
TRANSISTOR	E	B	C

TO-92-18R

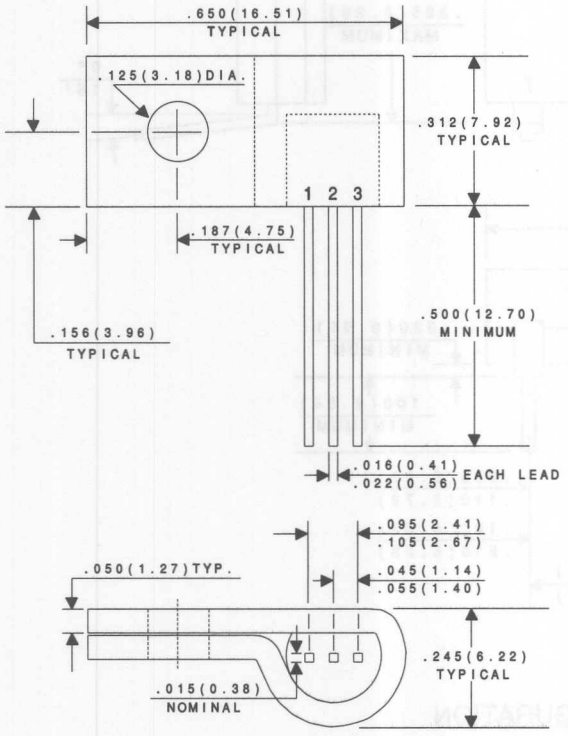


LEAD CODE	PIN 1	2	3
PUT	A	G	C
SCR	A	G	C
TRANSISTOR	C	B	E

Mechanical Drawings (Continued)

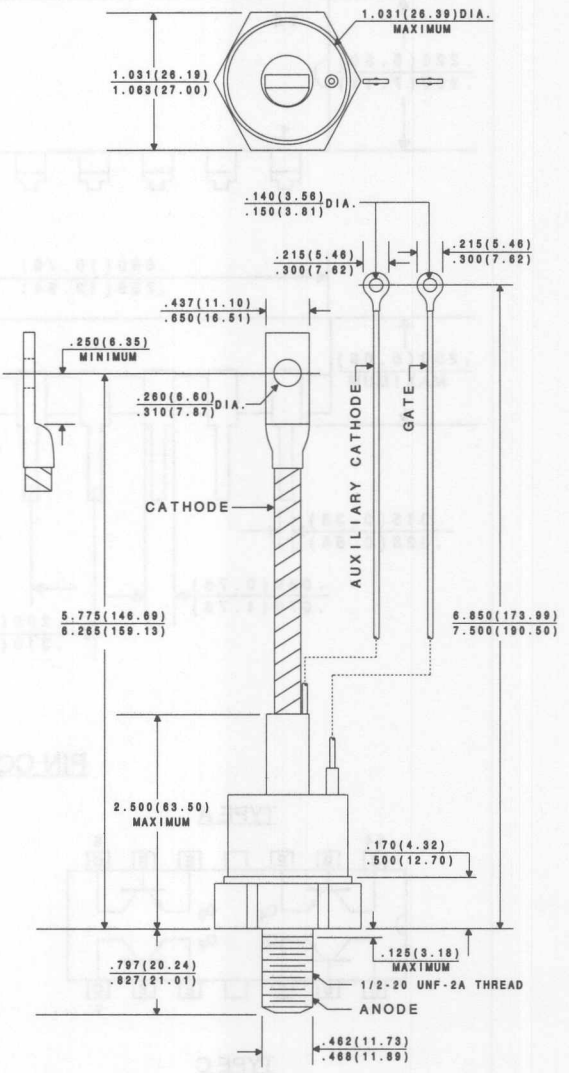
All Dimensions in inches (mm).

TO-92HS



LEAD CODE	PIN		
	1	2	3
EBC	E	B	C
ECB	E	C	B
CBE	C	B	E

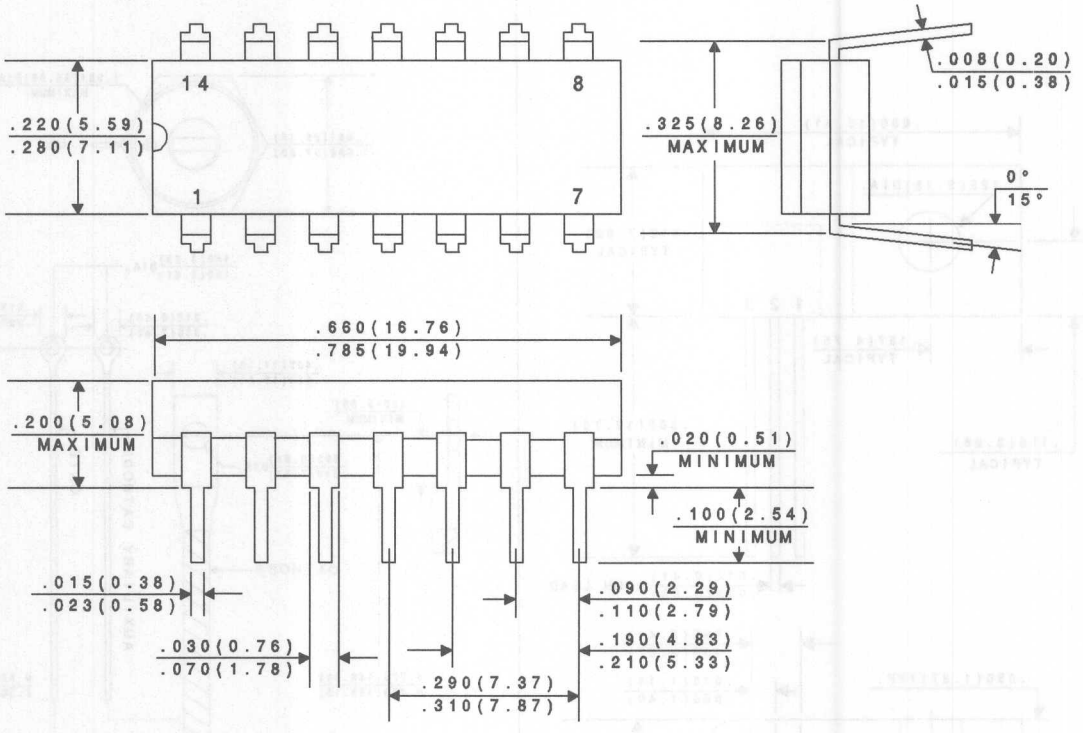
TO-94



Mechanical Drawings (Continued)

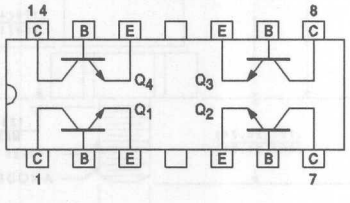
All Dimensions in inches (mm).

TO-116

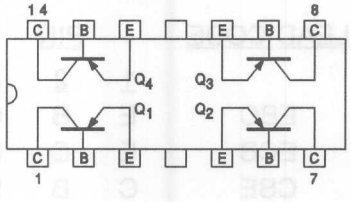


PIN CONFIGURATION

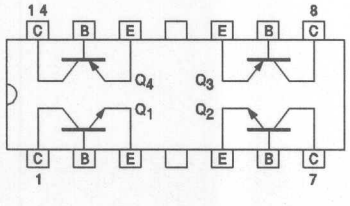
TYPE A



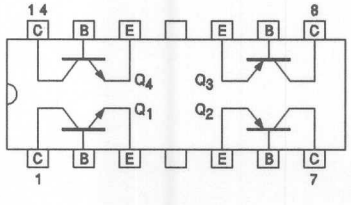
TYPE B



TYPE C



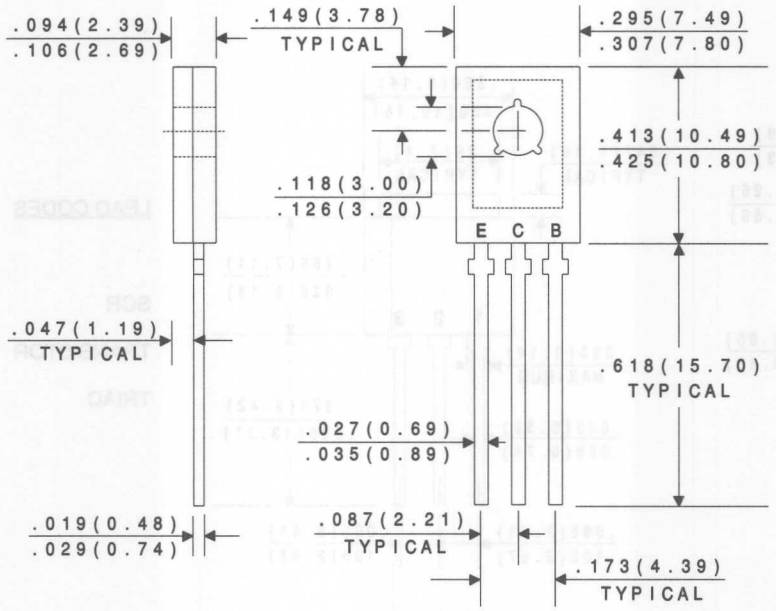
TYPE D



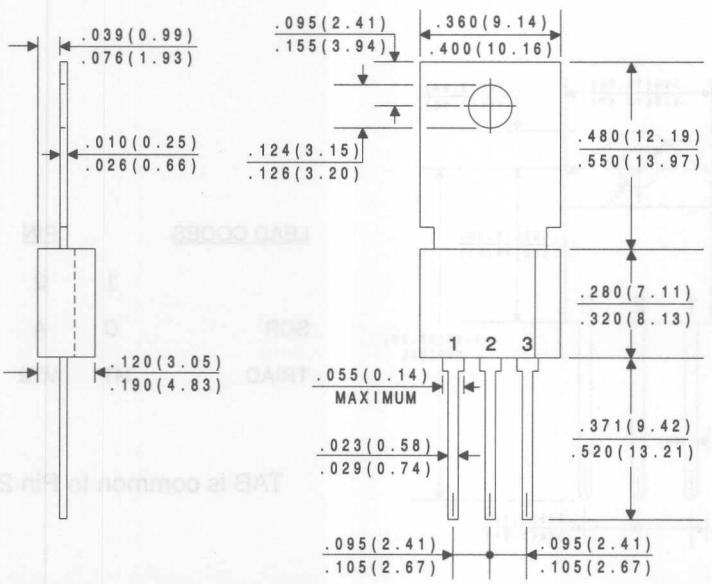
Mechanical Drawings (Continued)

All Dimensions in inches (mm).

TO-126



TO-202

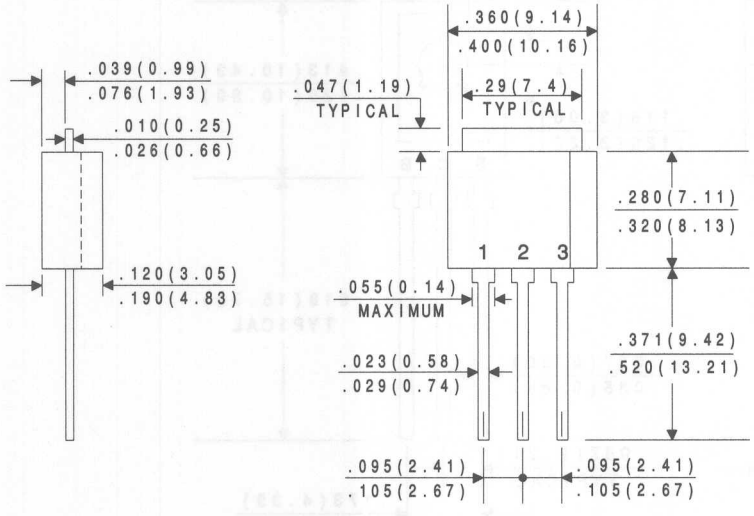


LEAD CODES	PIN		
	1	2	3
SCR	C	A	G
TRANSISTOR	E	B	C
TRIAC	MT1	MT2	G

Mechanical Drawings (Continued)

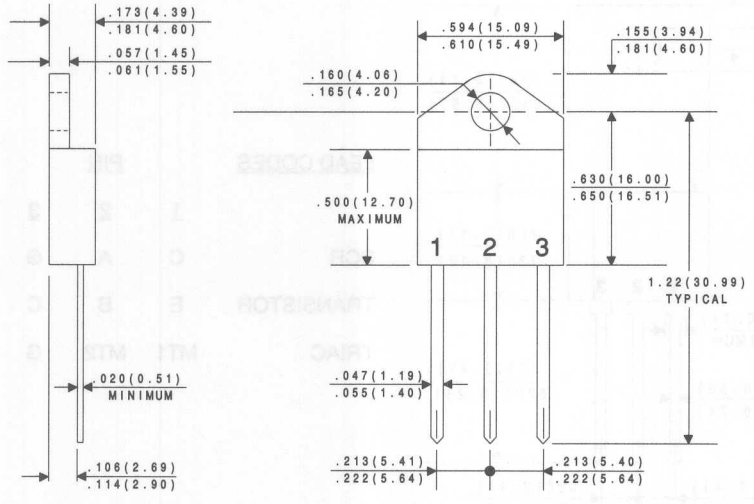
All Dimensions in inches (mm).

TO-202-2



LEAD CODES	PIN		
	1	2	3
SCR	C	A	G
TRANSISTOR	E	B	C
TRIAC	MT1	MT2	G

TO-218 Thyristor



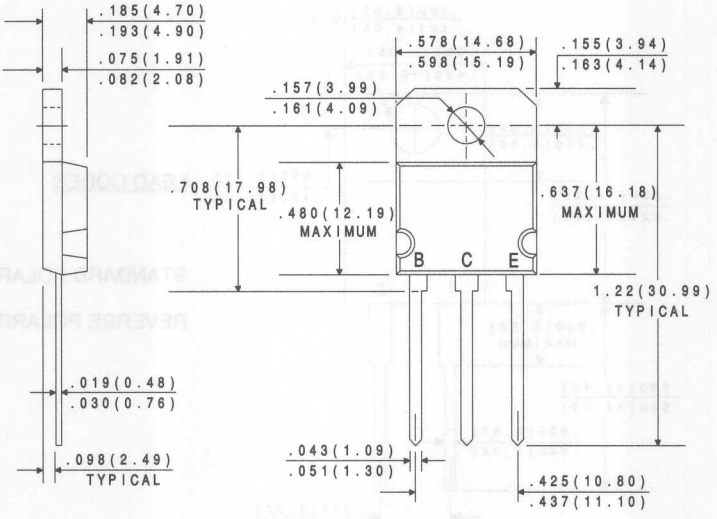
LEAD CODES	PIN		
	1	2	3
SCR	C	A	G
TRIAC	MT1	MT2	G

TAB is common to Pin 2.

Mechanical Drawings (Continued)

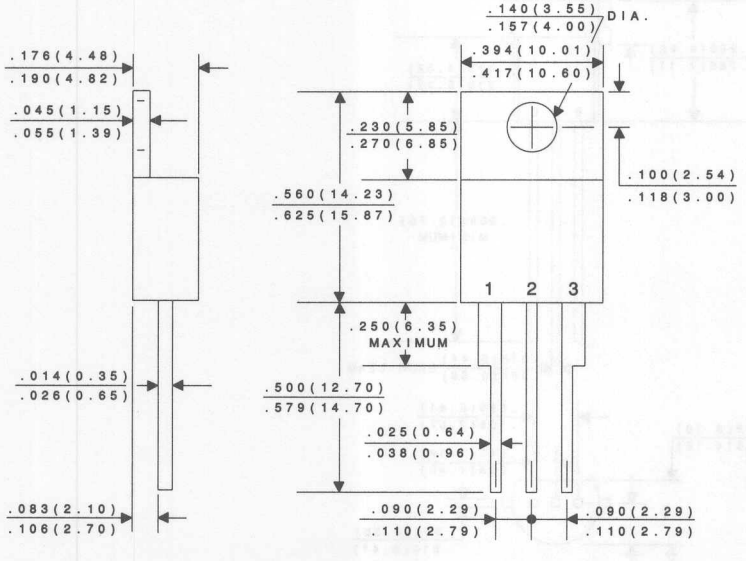
All Dimensions in inches (mm).

TO-218 Transistor



TAB is common to collector.

TO-220



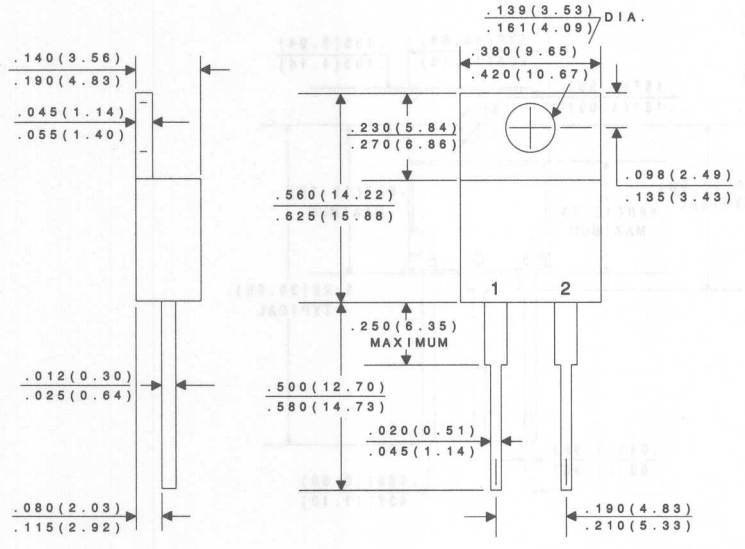
LEAD CODES	PIN		
	1	2	3
SCR	C	A	G
TRIAC	MT1	MT2	G
TRANSISTOR	B	C	E

For TO-220 Case, TAB is common to Pin 2.
For TO-220 ISOL Case, TAB is isolated.

Mechanical Drawings (Continued)

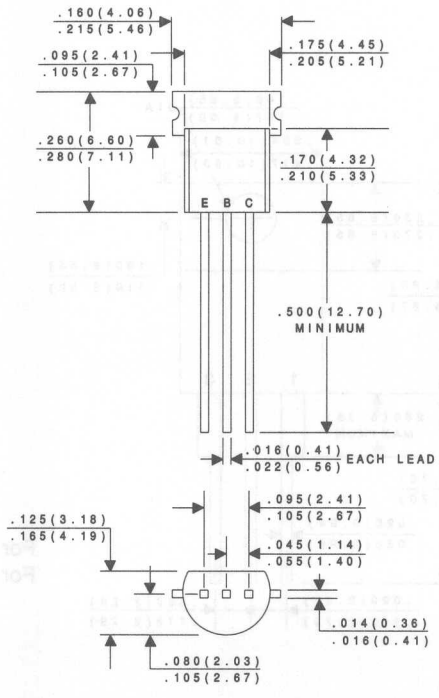
All Dimensions in inches (mm).

TO-220AC



LEAD CODES	PIN 1	2	TAB
STANDARD POLARITY	C	A	C
REVERSE POLARITY	A	C	A

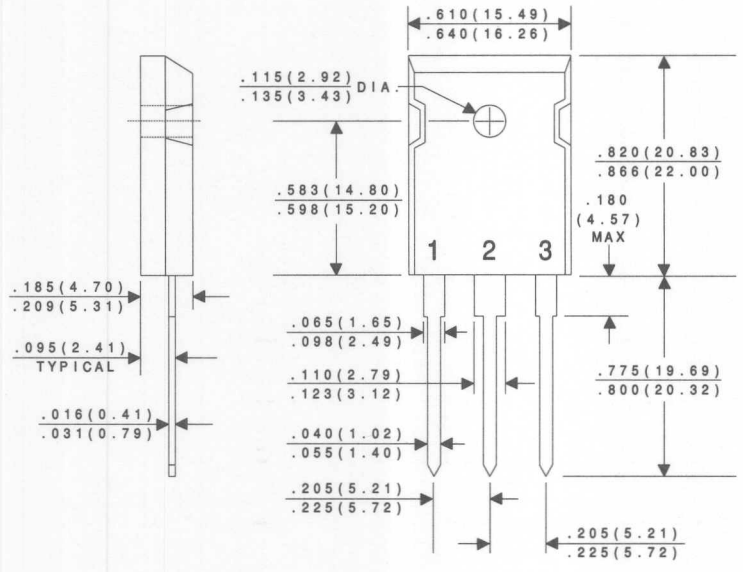
TO-237



Mechanical Drawings (Continued)

All Dimensions in inches (mm).

TO-247



LEAD CODES	PIN 1	2	3
TRANSISTOR	B	C	E
RECTIFIER, COMM. CATHODE	A_1	C_1C_2	A_2
RECTIFIER, COMM. ANODE	C_1	A_1A_2	C_2
RECTIFIER, SERIES	A_1	C_1A_2	C_2

Engineering Specifications

Central™
Semiconductor Corp.

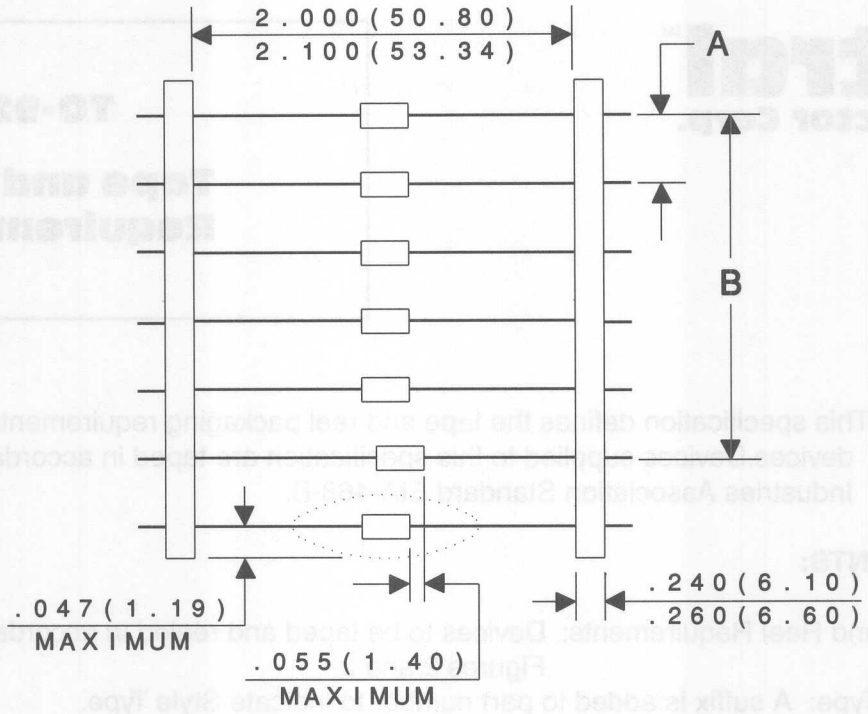
Axial Lead

Tape and Reel Requirements

1.0. PURPOSE: This specification defines the tape and reel requirements for axial lead devices. Devices supplied to this specification are taped in accordance with Electronic Industries Association Standard EIA-296-E.

2.0 REQUIREMENTS:

2.1 Tape Requirements: Devices to be taped in accordance with Figure 1.
2.2 Reel Dimensions: Devices to be placed on a reel in accordance with Figure 2.
2.3 Ordering Info: Add suffix TR to part number.
Example: 1N4148 TR (1N4148 switching diode, taped and reeled).
2.4 Packaging Base: See Standard Packing Specification to determine quantity per reel.



For devices with a nominal body diameter ≤ .200":

Dimension A=.190"(4.83mm) MIN, .210"(5.33mm) MAX

Dimension B=.941"(23.90mm) MIN, 1.059"(26.90mm) MAX

For devices with a nominal body diameter > .200":

Dimension A=.390"(9.91mm) MIN, .410"(10.41mm) MAX

Dimension B=1.941"(49.30mm) MIN, 2.059"(52.30mm) MAX

Figure 1. Taping Specification [All Dimensions in Inches (mm)].

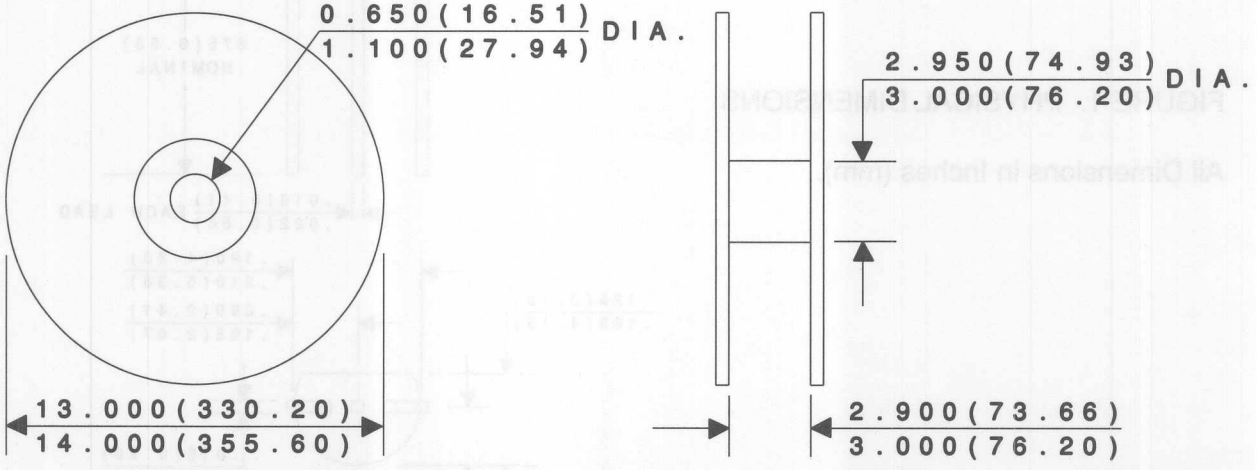


Figure 2. Reel Dimensions [All Dimensions in Inches (mm)].

Central™
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TO-92

Tape and Reel Requirements

1.0. PURPOSE: This specification defines the tape and reel packaging requirements for TO-92 devices.Devices supplied to this specification are taped in accordance with Electronic Industries Association Standard EIA-468-B.

2.0 REQUIREMENTS:

2.1 Tape and Reel Requirements: Devices to be taped and reeled in accordance with Figures 2 and 3.

2.2 Style Type: A suffix is added to part number to indicate Style Type.
Example: 2N4401 TRE (2N4401 taped and reeled in accordance with STYLE E).
Note: STYLE E is preferred.

2.3 Packaging Base: Devices to be taped 2000 pieces per reel.

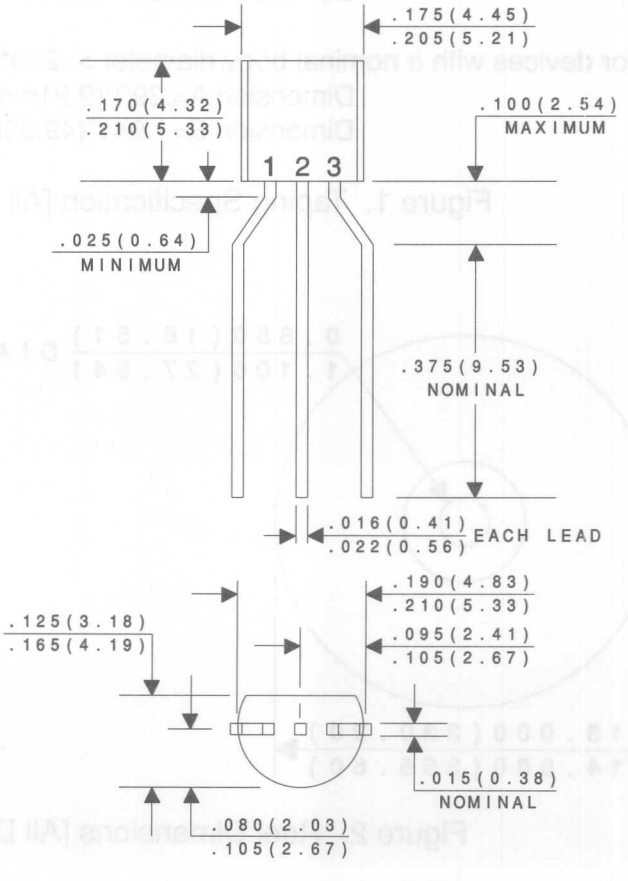


FIGURE 1. PHYSICAL DIMENSIONS

All Dimensions in Inches (mm).

TO-92 Tape and Reel Requirements
(Continued)

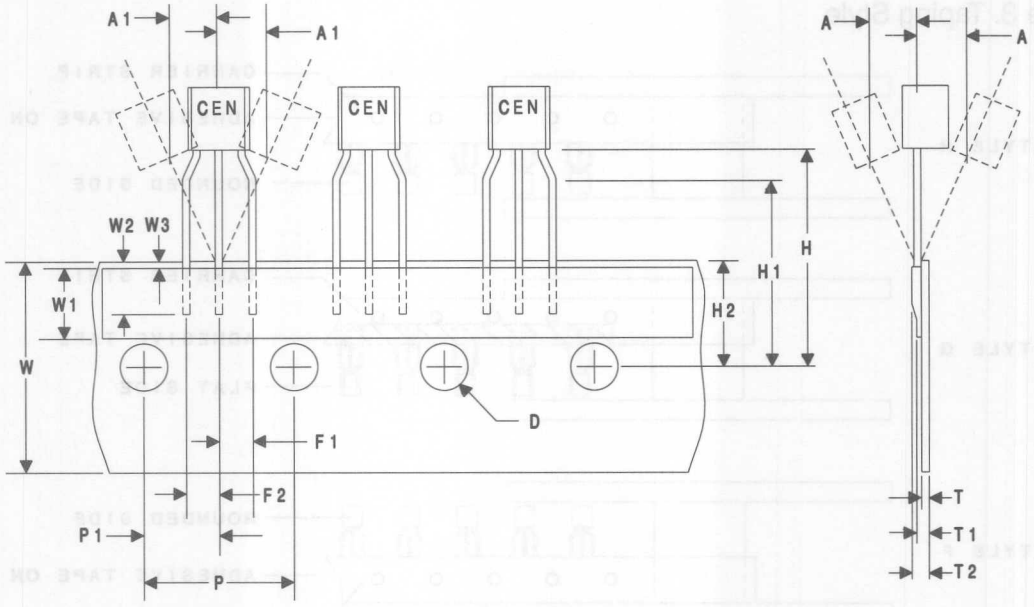


FIGURE 2. TAPING SPECIFICATIONS

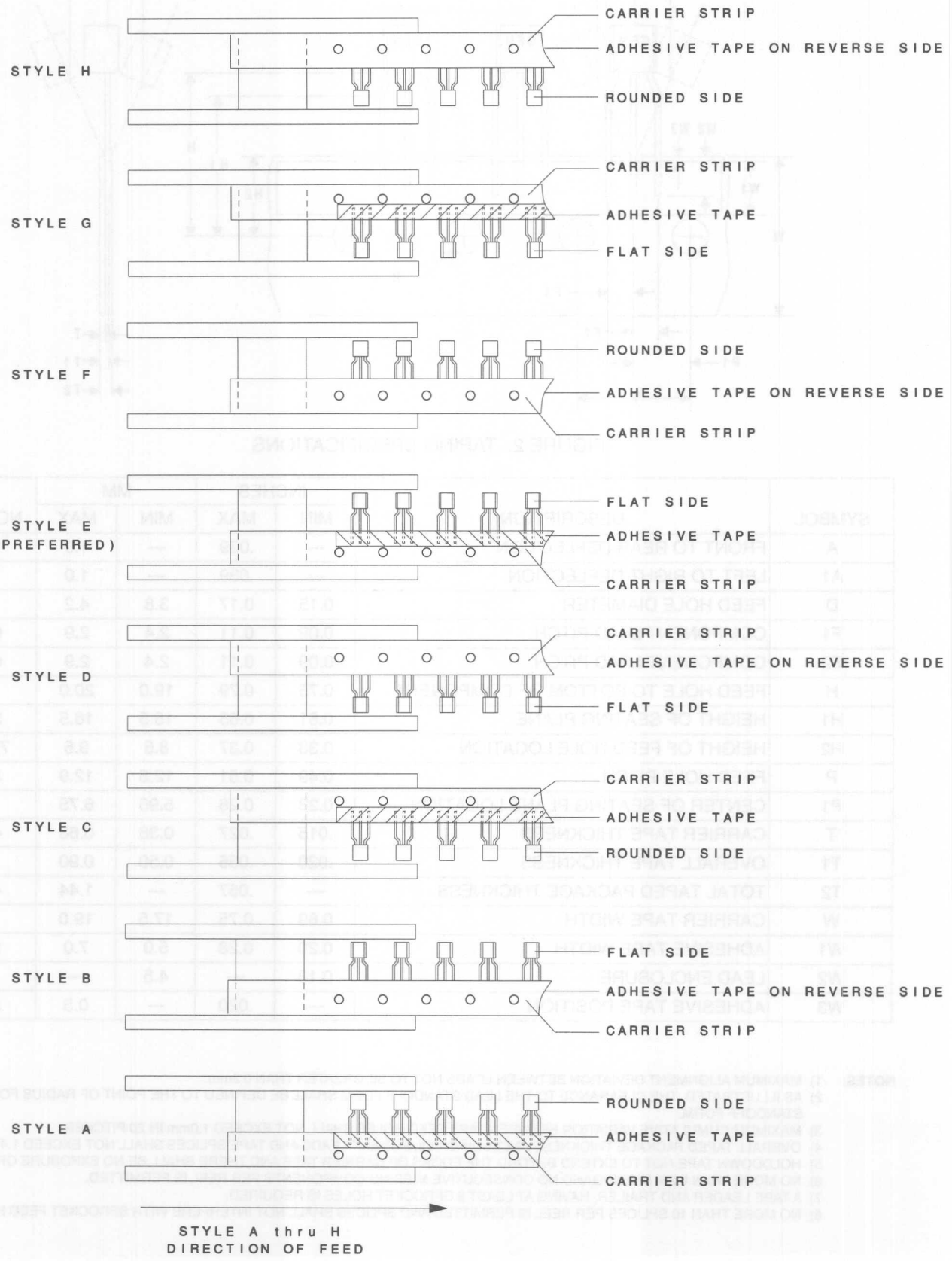
SYMBOL	DESCRIPTION	INCHES		MM		NOTE
		MIN	MAX	MIN	MAX	
A	FRONT TO REAR DEFLECTION	---	.039	---	1.0	1
A1	LEFT TO RIGHT DEFLECTION	---	.039	---	1.0	
D	FEED HOLE DIAMETER	0.15	0.17	3.8	4.2	
F1	COMPONENT LEAD PITCH	0.09	0.11	2.4	2.9	6
F2	COMPONENT LEAD PITCH	0.09	0.11	2.4	2.9	6
H	FEED HOLE TO BOTTOM OF COMPONENT	0.75	0.79	19.0	20.0	
H1	HEIGHT OF SEATING PLANE	0.61	0.65	15.5	16.5	2
H2	HEIGHT OF FEED HOLE LOCATION	0.33	0.37	8.5	9.5	7,8
P	FEED HOLE PITCH	0.49	0.51	12.5	12.9	3
P1	CENTER OF SEATING PLANE LOCATION	0.23	0.26	5.95	6.75	
T	CARRIER TAPE THICKNESS	.015	.027	0.38	0.68	4
T1	OVERALL TAPE THICKNESS	.020	.035	0.50	0.90	
T2	TOTAL TAPED PACKAGE THICKNESS	---	.057	---	1.44	4
W	CARRIER TAPE WIDTH	0.69	0.75	17.5	19.0	
W1	ADHESIVE TAPE WIDTH	0.20	0.28	5.0	7.0	5
W2	LEAD ENCLOSURE	0.18	---	4.5	---	
W3	ADHESIVE TAPE POSITION	---	.020	---	0.5	5

NOTES:
1) MAXIMUM ALIGNMENT DEVIATION BETWEEN LEADS NOT TO BE GREATER THAN 0.2mm.
2) AS ILLUSTRATED, THE CLEARANCE TO THE LEAD STANDOFF FORM SHALL BE DEFINED TO THE POINT OF RADIUS FOR THE STANDOFF FORM.
3) MAXIMUM CUMULATIVE VARIATION BETWEEN TAPE FEED HOLES SHALL NOT EXCEED 1.0mm IN 20 PITCHES.
4) OVERALL TAPED PACKAGE THICKNESS, INCLUDING COMPONENT LEADS AND TAPE SPLICES SHALL NOT EXCEED 1.44mm.
5) HOLDDOWN TAPE NOT TO EXTEND BEYOND THE EDGES OF CARRIER TAPE AND THERE SHALL BE NO EXPOSURE OF ADHESIVE.
6) NO MORE THAN 0.2% MISSINGAND NO CONSECUTIVE MISSING COMPONENTS PER REEL IS PERMITTED.
7) A TAPE LEADER AND TRAILER, HAVING AT LEAST 3 SPROCKET HOLES IS REQUIRED.
8) NO MORE THAN 10 SPLICES PER REEL IS PERMITTED AND SPLICES SHALL NOT INTERFERE WITH SPROCKET FEED HOLES.

TO-92 Tape and Reel Requirements

(Continued)

Figure 3. Taping Style



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TO-92 Ammopack Requirements

1.0. PURPOSE: This specification defines the TO-92 Ammopack requirements. Devices supplied to this specification are taped in accordance with Electronic Industries Association Standard EIA-468-B.

2.0 REQUIREMENTS:

2.1 Tape Requirements: Devices to be taped in accordance with Figure 2.
2.2 Style Type: STYLE M (PREFERRED) or STYLE P (See Figures 3 and 4).
2.3 Ordering Info: Add suffix to part number to indicate Style Type .
Suffix APM For STYLE M (Equivalent to reel pack STYLE E).
or
Suffix APP For STYLE P (Equivalent to reel pack STYLE A).
Example: 2N5366 APM (2N5366 transistor, Ammopack STYLE M).
2.4 Packaging Base: Devices to be taped 2000 pieces per Ammopack.

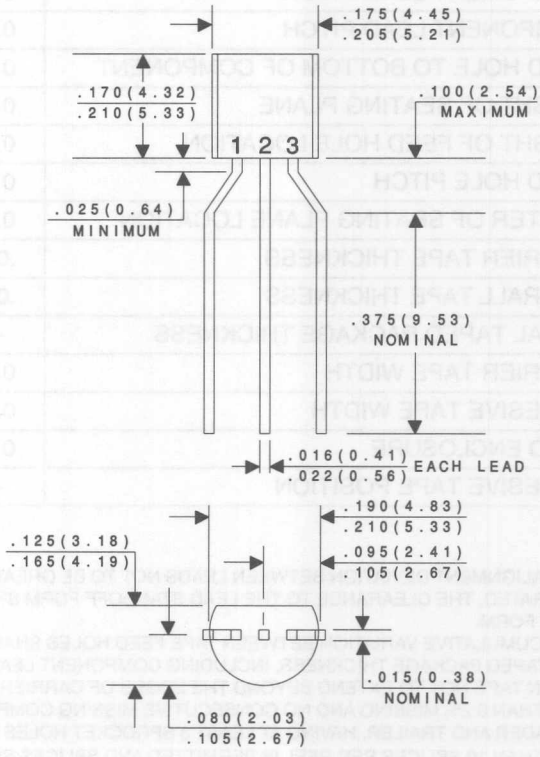

FIGURE 1. PHYSICAL DIMENSIONS

All Dimensions in Inches (mm).

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TO-92 Ammopack Requirements
(Continued)

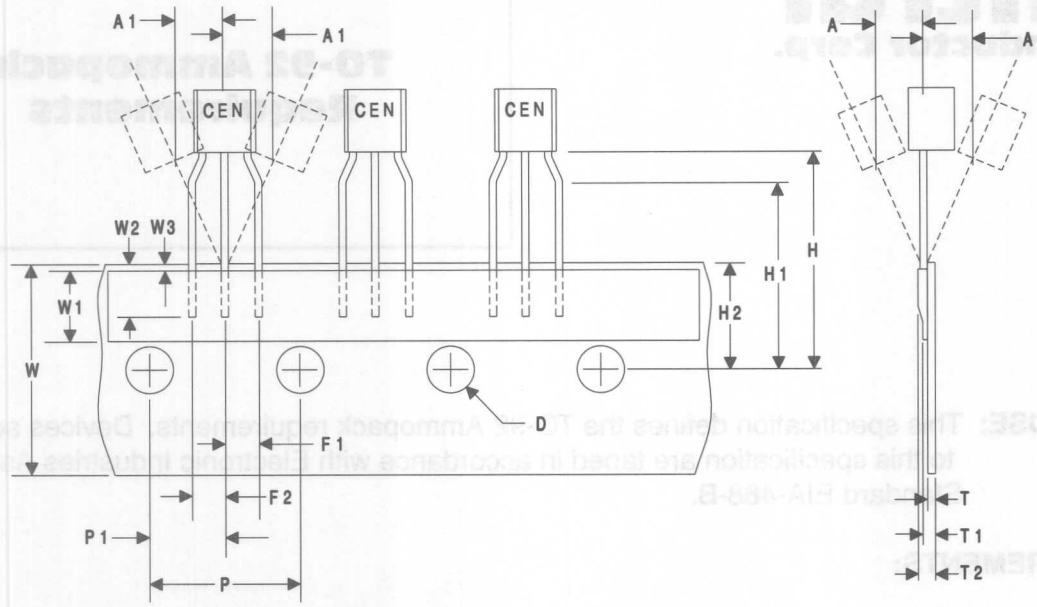


FIGURE 2. TAPING SPECIFICATIONS

SYMBOL	DESCRIPTION	INCHES		MM		NOTE
		MIN	MAX	MIN	MAX	
A	FRONT TO REAR DEFLECTION	---	.039	---	1.0	1
A1	LEFT TO RIGHT DEFLECTION	---	.039	---	1.0	
D	FEED HOLE DIAMETER	0.15	0.17	3.8	4.2	
F1	COMPONENT LEAD PITCH	0.09	0.11	2.4	2.9	6
F2	COMPONENT LEAD PITCH	0.09	0.11	2.4	2.9	6
H	FEED HOLE TO BOTTOM OF COMPONENT	0.75	0.79	19.0	20.0	
H1	HEIGHT OF SEATING PLANE	0.61	0.65	15.5	16.5	2
H2	HEIGHT OF FEED HOLE LOCATION	0.33	0.37	8.5	9.5	7,8
P	FEED HOLE PITCH	0.49	0.51	12.5	12.9	3
P1	CENTER OF SEATING PLANE LOCATION	0.23	0.26	5.95	6.75	
T	CARRIER TAPE THICKNESS	.015	.027	0.38	0.68	4
T1	OVERALL TAPE THICKNESS	.020	.035	0.50	0.90	
T2	TOTAL TAPED PACKAGE THICKNESS	---	.057	---	1.44	4
W	CARRIER TAPE WIDTH	0.69	0.75	17.5	19.0	
W1	ADHESIVE TAPE WIDTH	0.20	0.28	5.0	7.0	5
W2	LEAD ENCLOSURE	0.18	---	4.5	---	
W3	ADHESIVE TAPE POSITION	---	.020	---	0.5	5

NOTES:
1) MAXIMUM ALIGNMENT DEVIATION BETWEEN LEADS NOT TO BE GREATER THAN 0.2mm.
2) AS ILLUSTRATED, THE CLEARANCE TO THE LEAD STANDOFF FORM SHALL BE DEFINED TO THE POINT OF RADIUS FOR THE STANDOFF FORM.
3) MAXIMUM CUMULATIVE VARIATION BETWEEN TAPE FEED HOLES SHALL NOT EXCEED 1.0mm IN 20 PITCHES.
4) OVERALL TAPED PACKAGE THICKNESS, INCLUDING COMPONENT LEADS AND TAPE SPLICES SHALL NOT EXCEED 1.44mm.
5) HOLDDOWN TAPE NOT TO EXTEND BEYOND THE EDGES OF CARRIER TAPE AND THERE SHALL BE NO EXPOSURE OF ADHESIVE.
6) NO MORE THAN 0.2% MISSING AND NO CONSECUTIVE MISSING COMPONENTS PER REEL IS PERMITTED.
7) A TAPE LEADER AND TRAILER, HAVING AT LEAST 3 SPROCKET HOLES IS REQUIRED.
8) NO MORE THAN 10 SPLICES PER REEL IS PERMITTED AND SPLICES SHALL NOT INTERFERE WITH SPROCKET FEED HOLES.

TO-92 Ammopack Requirements
(Continued)

FIGURE 3. STYLE M (PREFERRED)

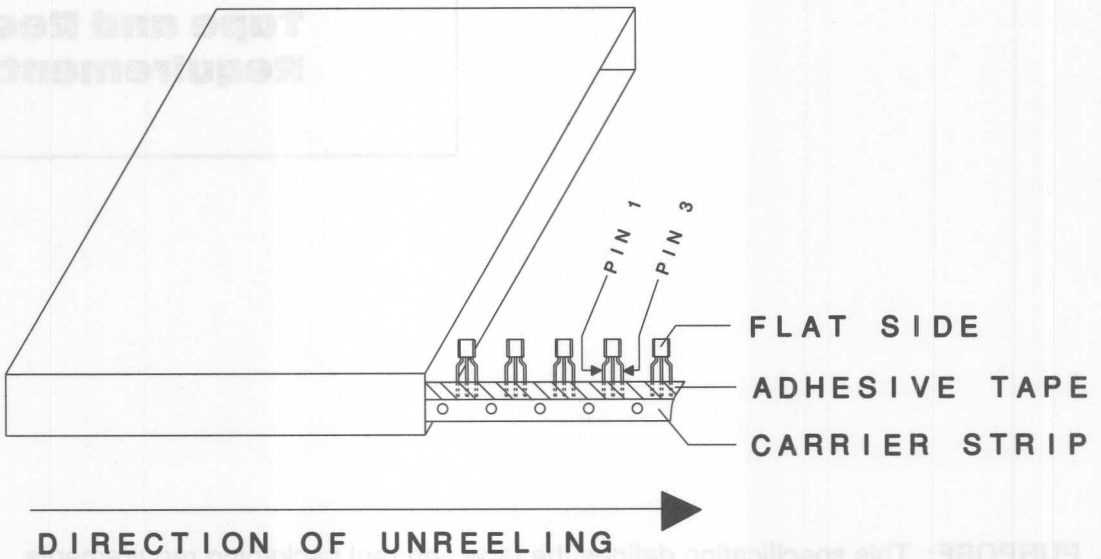
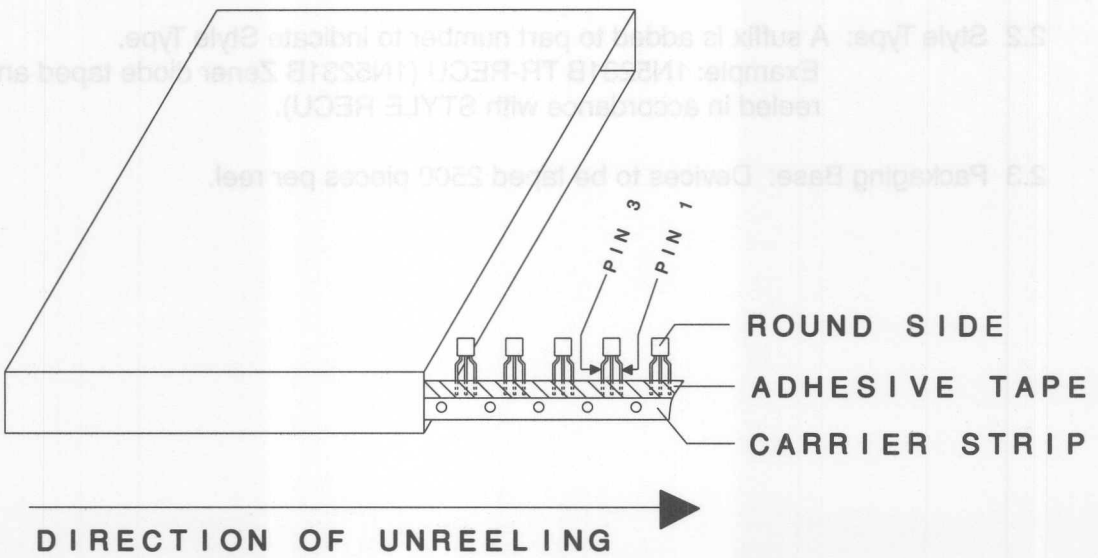


FIGURE 4. STYLE P



Note: The box is accessible from either side depending upon whether PIN 1 or PIN 3 is required at the leading edge.

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DO-35 Radial

Tape and Reel Requirements

1.0. PURPOSE: This specification defines the tape and reel packaging requirements for DO-35 Radial Formed devices. Devices supplied to this specification are taped in accordance with Electronic Industries Association Standard EIA-468-B.

2.0 REQUIREMENTS:

2.1 Tape and Reel Requirements: Devices to be taped and reeled in accordance with Figure 1 (RECU) or Figure 2 (RMCU).

2.2 Style Type: A suffix is added to part number to indicate Style Type. Example: 1N5231B TR-RECU (1N5231B Zener diode taped and reeled in accordance with STYLE RECU).

2.3 Packaging Base: Devices to be taped 2500 pieces per reel.

DO-35 Radial Tape and Reel Requirements
(Continued)

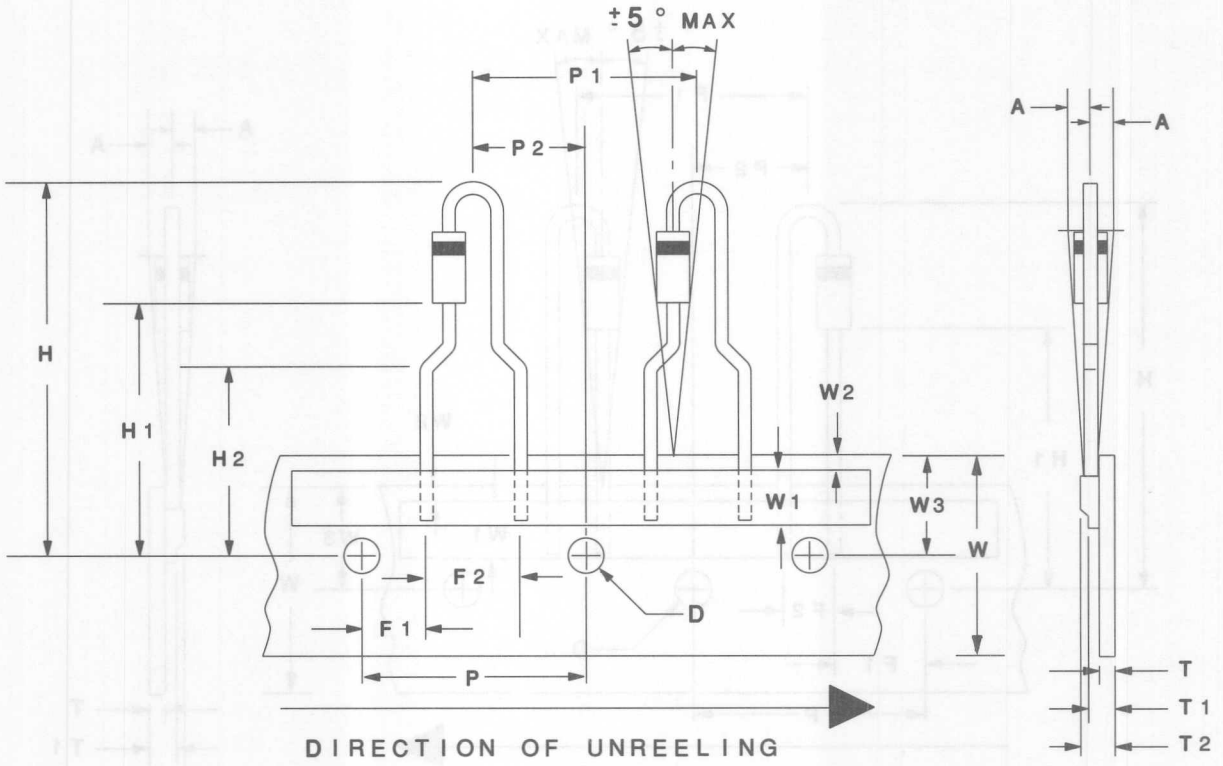

Figure 1. (RECU)

SYMBOL	DESCRIPTION	INCHES		MM		NOTE
		MIN	MAX	MIN	MAX	
A	FRONT TO REAR DEFLECTION	---	.039	---	1.0	
D	FEED HOLE DIAMETER	0.15	0.17	3.81	4.32	
F1	FEED HOLE CENTER TO LEAD	.124	.179	3.15	4.55	
F2	LEAD TO LEAD DISTANCE	.193	.213	4.90	5.41	
H	FEED HOLE TO TOP OF COMPONENT	---	1.27	---	32.3	
H1	FEED HOLE TO BOTTOM OF COMPONENT	.728	.807	18.5	20.5	
H2	HEIGHT OF SEATING PLANE	0.61	0.65	15.5	16.5	
P	FEED HOLE PITCH	0.49	0.51	12.4	13.0	1
P1	PITCH OF COMPONENTS	0.46	0.54	11.7	13.7	
P2	FEED HOLE TO CENTER OF COMPONENT	0.21	0.29	5.33	7.37	
T	CARRIER TAPE THICKNESS	.015	.027	0.38	0.68	
T1	OVERALL TAPE THICKNESS	.020	.035	0.50	0.90	
T2	TOTAL TAPED PACKAGE THICKNESS	---	.059	---	1.50	
W	CARRIER TAPE WIDTH	0.69	0.75	17.5	19.0	
W1	ADHESIVE TAPE WIDTH	0.20	0.28	5.08	7.11	2
W2	ADHESIVE TAPE POSITION	---	0.02	---	0.51	2
W3	FEED HOLE POSITION	0.33	0.37	8.38	9.40	

NOTES:
1) MAXIMUM CUMULATIVE VARIATION BETWEEN TAPE FEED HOLES SHALL NOT EXCEED 1.0mm IN 20 PITCHES.
2) HOLDDOWN TAPE NOT TO EXTEND BEYOND THE EDGES OF CARRIER TAPE AND THERE SHALL BE NO EXPOSURE OF ADHESIVE.
3) NO MORE THAN 0.2% MISSING AND NO CONSECUTIVE MISSING COMPONENTS PER REEL IS PERMITTED.
4) A TAPE LEADER AND TRAILER, HAVING AT LEAST 3 SPROCKET HOLES IS REQUIRED.
5) NO MORE THAN TEN SPLICES PER REEL IS PERMITTED AND SPLICES SHALL NOT INTERFERE WITH SPROCKET HOLES.

DO-35 Radial Tape and Reel Requirements
(Continued)

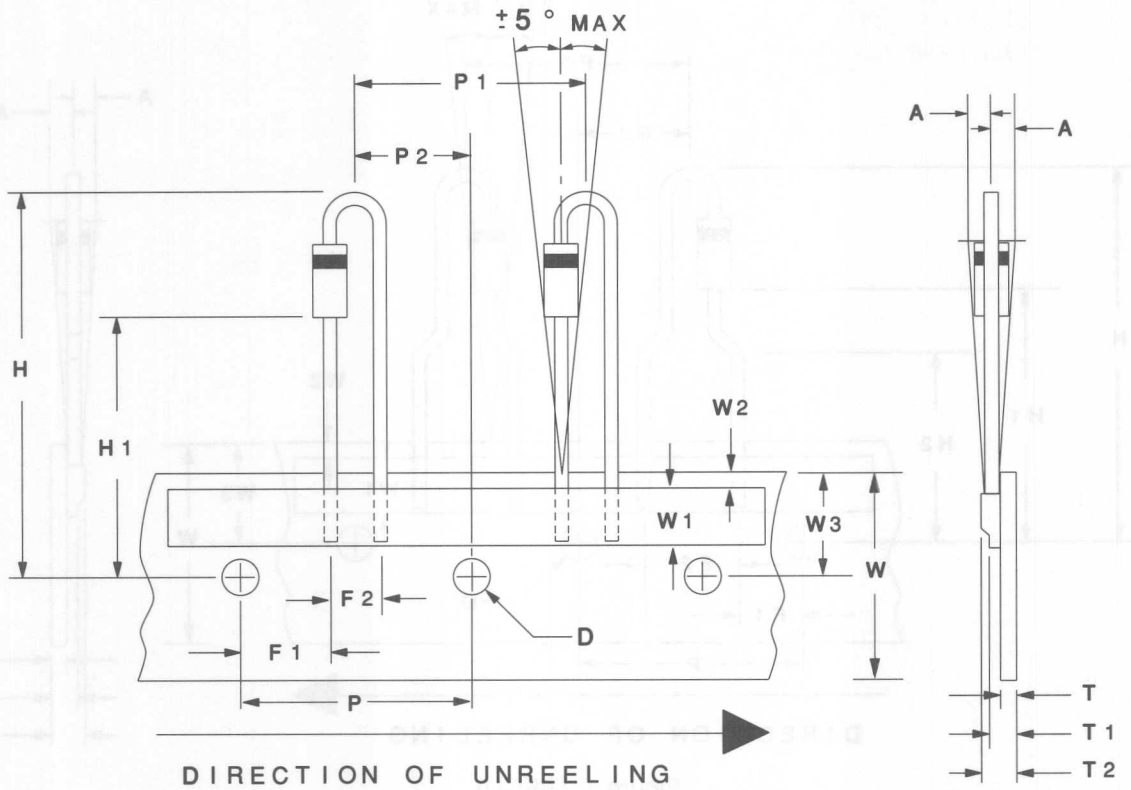

Figure 2. (RMCU)

SYMBOL	DESCRIPTION	INCHES		MM		NOTE
		MIN	MAX	MIN	MAX	
A	FRONT TO REAR DEFLECTION	---	.039	---	1.0	
D	FEED HOLE DIAMETER	0.15	0.17	3.81	4.32	
F1	FEED HOLE CENTER TO LEAD	.173	.228	4.39	5.79	
F2	LEAD TO LEAD DISTANCE	.094	.114	2.39	2.89	
H	FEED HOLE TO TOP OF COMPONENT	---	1.27	---	32.3	
H1	FEED HOLE TO BOTTOM OF COMPONENT	.728	.807	18.5	20.5	
P	FEED HOLE PITCH	0.49	0.51	12.4	13.0	1
P1	PITCH OF COMPONENTS	0.46	0.54	11.7	13.7	
P2	FEED HOLE TO CENTER OF COMPONENT	0.21	0.29	5.33	7.37	
T	CARRIER TAPE THICKNESS	.015	.027	0.38	0.68	
T1	OVERALL TAPE THICKNESS	.020	.035	0.50	0.90	
T2	TOTAL TAPED PACKAGE THICKNESS	---	.059	---	1.50	
W	CARRIER TAPE WIDTH	0.69	0.75	17.5	19.0	
W1	ADHESIVE TAPE WIDTH	0.20	0.28	5.08	7.11	2
W2	ADHESIVE TAPE POSITION	---	0.02	---	0.51	2
W3	FEED HOLE POSITION	0.33	0.37	8.38	9.40	

NOTES:
1) MAXIMUM CUMULATIVE VARIATION BETWEEN TAPE FEED HOLES SHALL NOT EXCEED 1.0mm IN 20 PITCHES.
2) HOLDDOWN TAPE NOT TO EXTEND BEYOND THE EDGES OF CARRIER TAPE AND THERE SHALL BE NO EXPOSURE OF ADHESIVE.
3) NO MORE THAN 0.2% MISSING AND NO CONSECUTIVE MISSING COMPONENTS PER REEL IS PERMITTED.
4) A TAPE LEADER AND TRAILER, HAVING AT LEAST 3 SPROCKET HOLES IS REQUIRED.
5) NO MORE THAN TEN SPLICES PER REEL IS PERMITTED AND SPLICES SHALL NOT INTERFERE WITH SPROCKET HOLES.

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DO-41SP Radial

Tape and Reel Requirements

1.0. PURPOSE: This specification defines the tape and reel packaging requirements for DO-41SP Radial Formed devices. Devices supplied to this specification are taped in accordance with Electronic Industries Association Standard EIA-468-B.

2.0 REQUIREMENTS:

2.1 Tape and Reel Requirements: Devices to be taped and reeled in accordance with Figure 1 (RPCU).

2.2 Style Type: A suffix is added to part number to indicate Style Type.
Example: CEN526 TR-RPCU (CEN526 selected rectifier taped and reeled in accordance with STYLE RPCU).

2.3 Packaging Base: Devices to be taped 2500 pieces per reel.
Devices to be taped 2000 pieces per Ammo pack.

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DO-41SP Radial Tape and Reel Requirements
(Continued)

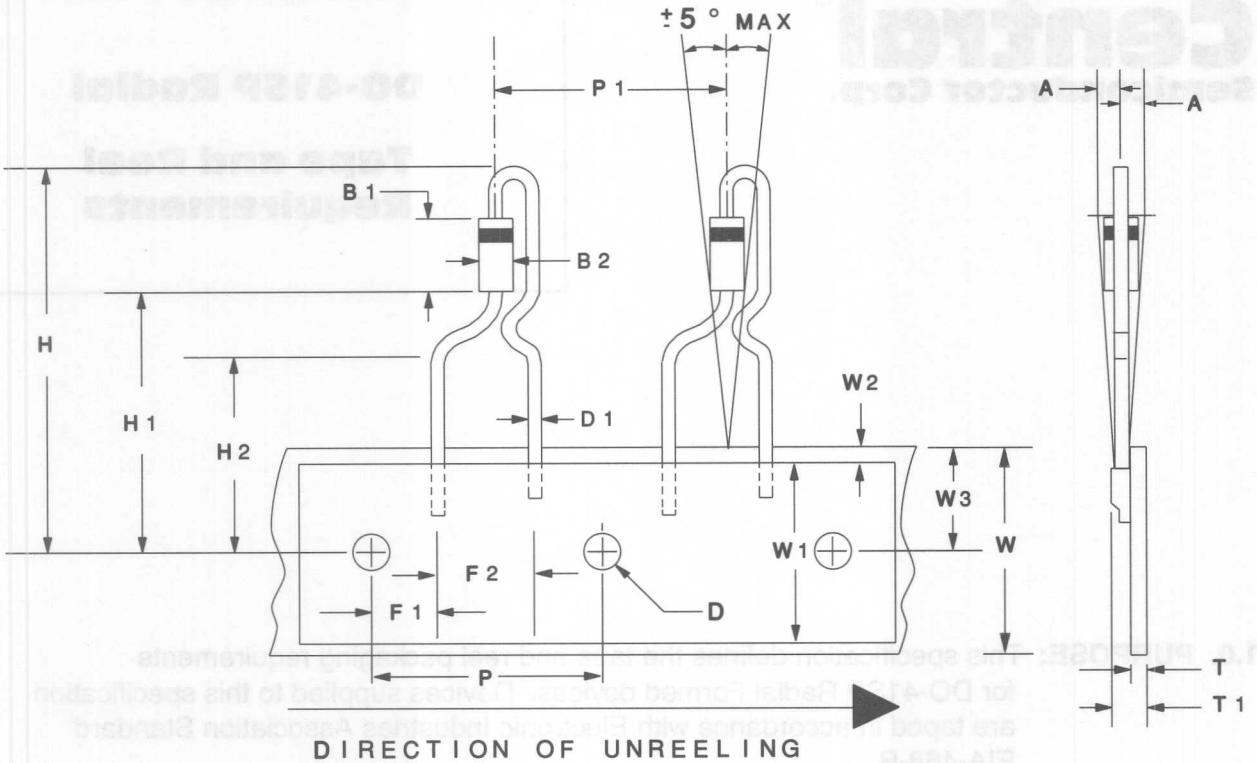

Figure 1. (RPCU)

SYMBOL	DESCRIPTION	INCHES		MM		NOTE
		MIN	MAX	MIN	MAX	
A	FRONT TO REAR DEFLECTION	---	.039	---	1.00	
B1	BODY HEIGHT	.160	.205	4.06	5.21	
B2	BODY DIAMETER	.080	.107	2.03	2.72	
D	FEED HOLE DIAMETER	.150	.165	3.80	4.20	
D1	LEAD DIAMETER	.021	.025	0.53	0.64	
F1	FEED HOLE CENTER TO LEAD	.124	.179	3.15	4.55	
F2	LEAD TO LEAD DISTANCE	.177	.217	4.50	5.50	
H	FEED HOLE TO TOP OF COMPONENT	---	1.27	---	32.3	
H1	FEED HOLE TO BOTTOM OF COMPONENT	.728	.807	18.5	20.5	
H2	HEIGHT OF SEATING PLANE	.610	.650	15.5	16.5	
P	FEED HOLE PITCH	.461	.539	11.7	13.7	1
P1	PITCH OF COMPONENTS	.461	.539	11.7	13.7	
T	CARRIER TAPE THICKNESS	.015	.027	0.38	0.68	
T1	TOTAL TAPED PACKAGE THICKNESS	---	.059	---	1.50	
W	CARRIER TAPE WIDTH	.689	.728	17.5	18.5	
W1	ADHESIVE TAPE WIDTH	.453	.531	11.5	13.5	2
W2	ADHESIVE TAPE POSITION	---	.024	---	0.60	2
W3	FEED HOLE POSITION	.335	.384	8.50	9.75	

NOTES:
1) MAXIMUM CUMULATIVE VARIATION BETWEEN TAPE FEED HOLES SHALL NOT EXCEED 1.0mm IN 20 PITCHES.
2) HOLDDOWN TAPE NOT TO EXTEND BEYOND THE EDGES OF CARRIER TAPE AND THERE SHALL BE NO EXPOSURE OF ADHESIVE.
3) NO MORE THAN 0.2% MISSING AND NO CONSECUTIVE MISSING COMPONENTS PER REEL IS PERMITTED.
4) A TAPE LEADER AND TRAILER, HAVING AT LEAST 3 SPROCKET HOLES IS REQUIRED.
5) NO MORE THAN TEN SPLICES PER REEL IS PERMITTED AND SPLICES SHALL NOT INTERFERE WITH SPROCKET HOLES.

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Standard Packing Quantity & Method

Purpose: This specification defines the Standard Packing Quantity (SPQ) and packing method for all discrete semiconductor devices manufactured by Central Semiconductor Corp.

How to Use: In order to use the following Standard Packing Chart, determine the case number from the Selection Guide for the type to be supplied. Locate the case on the chart and read across horizontally the Standard Packing Quantity and Packing Code.

The packing code specifies the packing method for the Standard Packing Quantity.

PACKING CODE:

A = Axial taped and reeled in accordance with EIA-296-E. If required, individual reels placed in pink poly antistatic coated bags (surface resistivity of $>10^9$ and $<10^{13}$ ohms persquare).

C = Antistatic coated plastic sleeves (surface resistivity of $>10^9$ and $<10^{13}$ ohms per square).

D = White corrugated box with black conductive coating (surface resistivity of $<10^5$ ohms per square).

E = White corrugated box containing devices wrapped in pink poly antistatic coated bags (surface resistivity of $>10^9$ and $<10^{13}$ ohms per square).

F = Black conductive plastic vial (surface resistivity of $<10^5$ ohms per square).

G = Taped and reeled in accordance with EIA-481-A. Carrier material black conductive plastics (surface resistivity $<10^5$ ohms per square).

I = Radial taped and reeled in accordance with EIA-468-B. If required, individual reels placed in pink poly antistatic coated bags (surface resistivity of $>10^9$ and $<10^{13}$ ohms per square).

K = Radial Ammopack in accordance with EIA-468-B.

Standard Packing Quantity & Method

(Continued)

CASE	SPQ	PACKING CODE
AX-5W BK	500	D
AX-5W TR	5K	A
CASE 106 BK	250	D
CASE 106 TR	800	A
CASE 125	400	D
CASE A	250	D
CASE B-M	35	C
CASE C	100	D
CASE CM	100	D
CASE D	100	D
CASE DM	50	D
CASE E	50	D
CASE F	100	D
CASE FP	100	D
CASE FPW	100	D
CASE H	500	D
CERSOT BK	250	F
DIP	50	C
DO-1	250	D
DO-4	250	D
DO-5	100	D
DO-7 BK	2K	D
DO-7 TR	5K	A
DO-8	25	E
DO-9	10	E
DO-13	250	D
DO-15 BK	1K	D
DO-15 TR	4K	A
DO-29 BK	2K	D
DO-34 BK	2.5K	D
DO-35 AP-RECU	2.5K	I
DO-35 BK	2.5K	D
DO-35 TR	10K	A
DO-35 TR4K	4K	A
DO-35 TR-RECD	2.5K	I
DO-35 TR-RECU	2.5K	I
DO-35 TR-RMCU	2.5K	I
DO-41 BK	2K	D
DO-41 TR	5K	A
DO-41SP AP-RPCU	2K	K
DO-41SP BK	2K	D
DO-41SP TR	5K	A
DO-41SP TR-RPCU	2.5K	I
DO-201 BK	500	D
DO-201 TR	1.4K	A
DO-201AD BK	500	D

CASE	SPQ	PACKING CODE
DO-201AD TR	1.2K	A
DPAK BK	150	F
DPAK TR13	2.5K	G
DPAK-L	500	F
GPR-1A BK	1K	D
GPR-1A TR	4.5K	A
GPR-3A BK	500	D
GPR-3A TR	1.6K	A
GPR-4A BK	500	D
GPR-4A TR	1.6K	A
HDDIP BK	350	F
HDDIP TR13	3K	G
MELF BK	800	F
MELF TR	1.5K	G
MELF TR13	5K	G
SMA BK	800	F
SMA TR13	5K	G
SMB BK	600	F
SMB TR13	3K	G
SMC BK	200	F
SMC TR13	3K	G
SMDIP	50	C
SMDIP TR13	1K	G
SO-8	100	D
SOD-80 BK	4K	F
SOD-80 TR	2.5K	G
SOD-80 TR13	10K	G
SOD-323 BK	5K	F
SOD-323 TR	3K	G
SOT-23 BK	3.5K	F
SOT-23 TR	3K	G
SOT-23 TR13	10K	G
SOT-89 BK	900	F
SOT-89 TR	1K	G
SOT-89 TR13	4K	G
SOT-143 BK	1K	F
SOT-143 TR	3K	G
SOT-223 BK	350	F
SOT-223 TR	1K	G
SOT-323 BK	5K	F
SOT-323 TR	3K	G
STB-1	2.5K	D
TO-1	250	D
TO-1HS	250	D
TO-3	20	C

CASE	SPQ	PACKING CODE
TO-3P	50	D
TO-5	250	D
TO-18	2K	D
TO-18-5	1K	D
TO-18LL	1K	D
TO-36	25	D
TO-39	500	D
TO-46	2.5K	D
TO-48	100	D
TO-52	2K	D
TO-64	250	D
TO-65	100	D
TO-66	30	C
TO-71	500	D
TO-72	2K	D
TO-78	500	D
TO-92	2.5K	D
TO-92 AP	2K	K
TO-92 TR	2K	I
TO-92-18	2K	D
TO-92-18R	2K	D
TO-92-5R	2K	D
TO-92-5T	2K	D
TO-92-5T1	2K	D
TO-92-5T2	2K	D
TO-92HS	500	D
TO-94	10	E
TO-105	500	D
TO-106	2K	D
TO-116	25	C
TO-126	1K	D
TO-126-FP	1K	D
TO-202	500	D
TO-202-2	750	D
TO-218	100	D
TO-220	400	D
TO-220 SL	50	C
TO-220 TR	1K	I
TO-237	2K	D
TO-237 AP	2K	K
TO-237 TR	2K	I
TO-237-5	2K	D
TO-237-18	2K	D
TO-237-18R	2K	D
TO-247	100	D

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Labeling Specification

1.0. Purpose: This Specification defines the layout and identification of the Inner Carton/Reel Label used by Central Semiconductor Corp.

1.1. This label must be affixed to each inner carton/reel in the shipment.

1.2. Label Information and Layout:

1) CENTRAL P/N:	Line 1) Central Part Number Number (Up to 25 Characters)
2) CUSTOMER P/N:	Line 2) Customer Part Number (Up to 25 Characters)
3) PURCHASE O/N:	Line 3) Customer's Purchase Order Number (Up to 25 Characters)
4) QUANTITY:	Line 4) Quantity of Devices. (Up to 15 Characters)
5) LOT NUMBER:	Line 5) Lot Number of the Devices. (Up to 25 Characters)
6) DATE CODE:	Line 6) Date Code of the Devices. (Up to 5 Characters)
7) SHIP DATE:	Line 7) Ship Date - The day cartons are Shipped from Central. (Month-Day-Year)
8) MARKING CODE:	Line 8) Marking of the Device. (Applies to SOT23, SOT-143 and SMB Devices only)

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Bar Code Identification Label

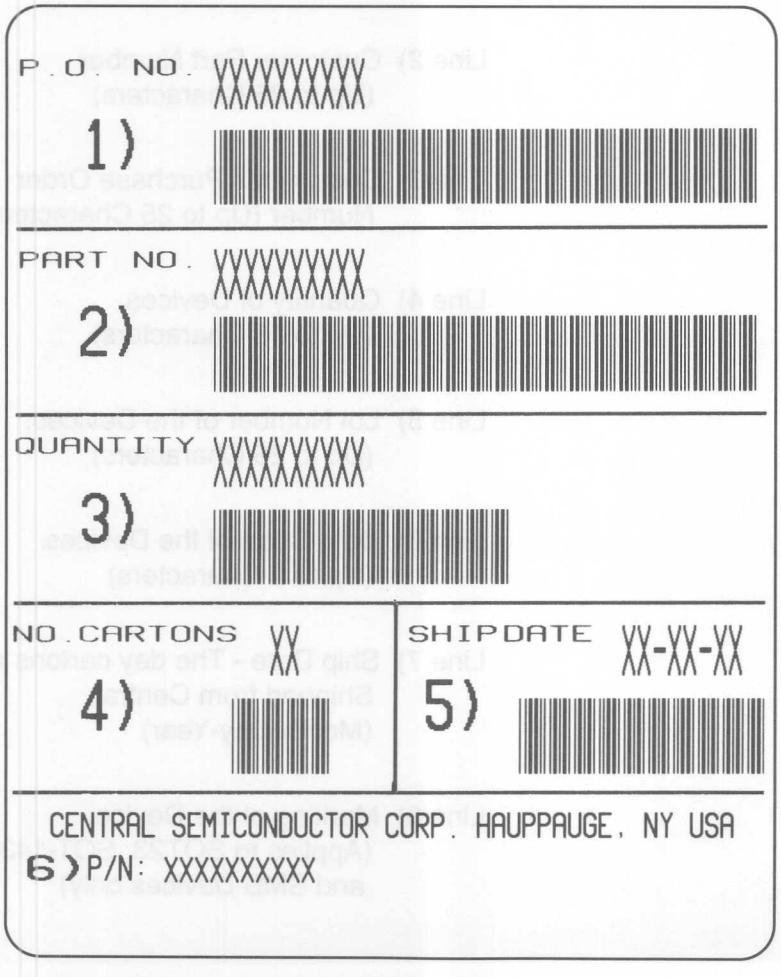
Note: Bar Code Label Available Upon Request.

1.0. Purpose: This Specification defines the layout and identification of the Bar Code Label used by Central Semiconductor Corp.

1.1. This label must be affixed to each carton in the shipment and to the reverse side of the packing slip.

1.2. Bar codes are type 3-of-9 (Code 39) Symbology.

1.3. Label Information and Layout:



Line 1) Customer Purchase Order Number (Up to 30 Characters)

Line 2) Customer Part Number (Up to 30 Characters)

Line 3) Total Quantity in Shipment. (Up to 15 Characters)

Line 4) Total Number of Cartons in Shipment. (Up to 2 Characters)

Line 5) Ship Date - The day cartons are Shipped from Central. (Month-Day-Year)

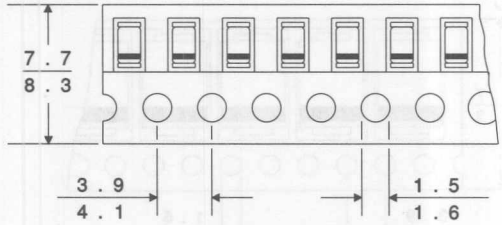
Line 6) Central Semiconductor Corp. Hauppauge, NY USA Central Part Number (Up to 30 Characters)

Label Size - 4" x 5"

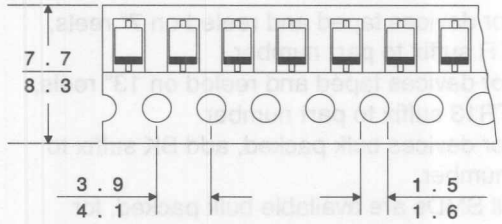
Surface Mount Tape Dimensions and Orientation: (Dimensions in mm)

8 mm

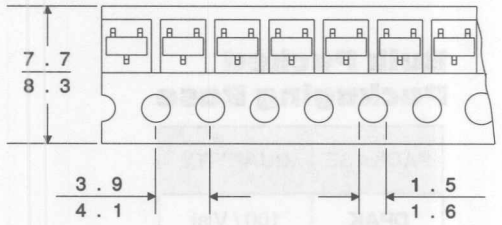
SOD-80



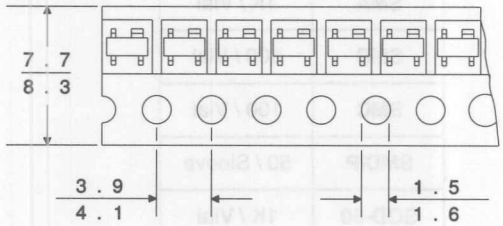
SOD-323



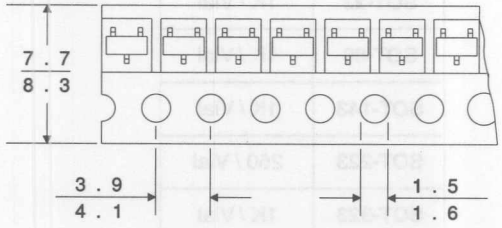
SOT-23



SOT-143

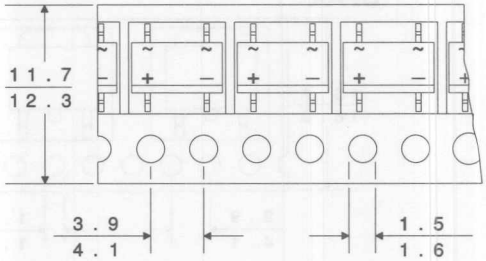


SOT-323

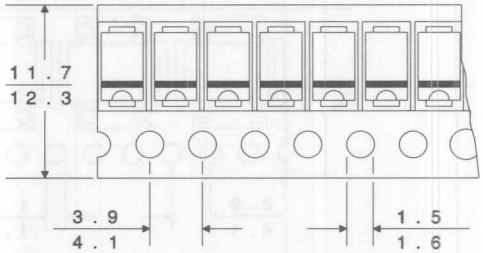


12 mm

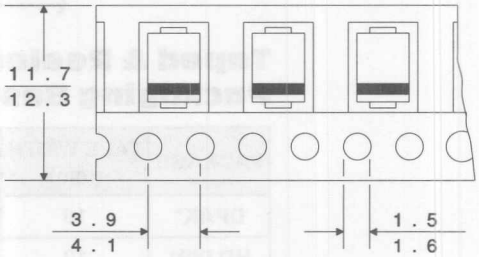
HD DIP



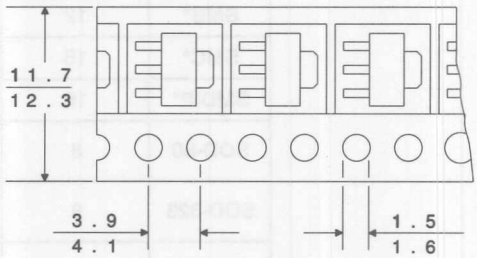
SMA



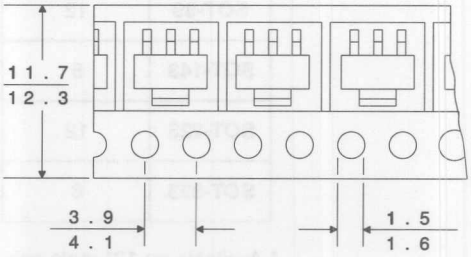
SMB



SOT-89



SOT-223

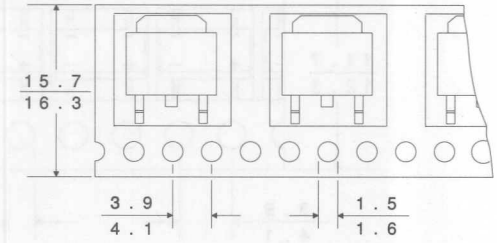


Direction of Unreeling

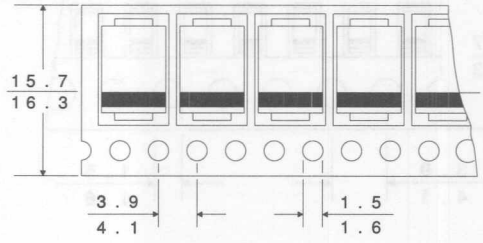
Surface Mount Tape Dimensions and Orientation (Dimensions in mm.)
(Continued)

16 mm

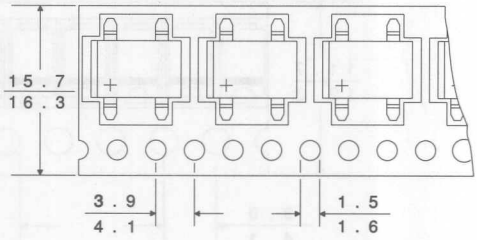
DPAK



SMC



SMDIP



Direction of Unreeling

ORDERING INFO:

- For devices taped and reeled on 7" reels, add TR suffix to part number.
- For devices taped and reeled on 13" reels, add TR13 suffix to part number
- For devices bulk packed, add BK suffix to part number.
- All SMDs are available bulk packed, for prototype and manual placement applications.
- Bulk SMDs are shipped in black plastic, antistatic vials with hinged lids.

Taped & Reeled Packaging Base

PACKAGE	TAPE WIDTH (mm)	REEL SIZE (INCH)	QUANTITY PER REEL
DPAK*	16	13	2,500
HD DIP*	12	13	3,000
SMA*	12	13	5,000
SMB*	12	13	3,000
SMC*	16	13	3,000
SMDIP*	16	13	1,000
SOD-80	8	7 13	2,500 10,000
SOD-323	8	7 13	3,000 10,000
SOT-23	8	7 13	3,000 10,000
SOT-89	12	7 13	1,000 4,000
SOT-143	8	7 13	3,000 10,000
SOT-223	12	7 13	1,000 4,000
SOT-323	8	7 13	3,000 10,000

* Available on 13" reels only.

Bulk Packed Packaging Base

PACKAGE	QUANTITY
DPAK	100 / Vial
HD DIP	100 / Sleeve
SMA	1K / Vial
SMB	500 / Vial
SMC	100 / Vial
SMDIP	50 / Sleeve
SOD-80	1K / Vial
SOD-323	1K / Vial
SOT-23	1K / Vial
SOT-89	1K / Vial
SOT-143	1K / Vial
SOT-223	250 / Vial
SOT-323	1K / Vial